The Metals **REVIEW**

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THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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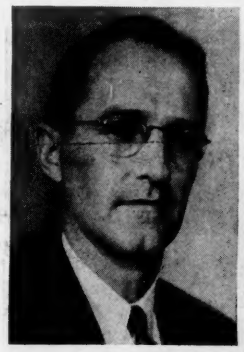
Nominees for A.S.M. Offices Announced

Herty, Boegehold and Work Named for Top Offices, Jominy and Chipman Trustees

The National Nominating Committee of the American Society for Metals has selected Charles H. Herty, Jr., assistant to vice-president, Bethlehem Steel Co., Bethlehem, Pa., and vice-president of the Society during the past year, as nominee for the office of president. A. L. Boegehold, head of the metallurgy department, Research Laboratories Division, General Motors Corp., Detroit, has been named for vice-president, and Harold K. Work, manager of research and development, Jones & Laughlin Steel Corp., Pittsburgh, for treasurer. Two new trustees have been nominated—namely, Walter E. Jominy, chief metallurgist, Dodge Chicago Plant, Chrysler Corp., and John Chipman, professor of metallurgy, Massachusetts Institute of Technology.



C. H. Herty, Jr.
For President

A. L. Boegehold
For Vice-President

H. K. Work
For Treasurer

W. E. Jominy
For Trustee

John Chipman
For Trustee

Nominations Close July 15

The Constitution provides that additional nominations may be made prior to July 15 by written communications addressed to the Secretary of the Society and signed by any 50 members. If no such additional nominations are received prior to July 15, nominations shall be closed and the Secretary, at the next annual meeting in the fall, shall cast the unanimous vote of all members for the above candidates.

Dr. Herty has been at Bethlehem since 1934, and before that was director of research, Metallurgical Advisory Board, Pittsburgh. His studies on the physical chemistry of steel making won him the Sauveur Achievement Award of the A.S.M. in 1943. He was a Campbell Lecturer in 1931 and has been a recipient of the Robert W. Hunt Medal of the A.I.M.E.

Alfred Lindley Boegehold has been head of the metallurgy department at G.M. Research Laboratories since 1925. He is a past chairman of the Detroit Chapter A.S.M. and has served as a national trustee since 1943.

The new nominee for treasurer, Harold K. Work (likewise a past chairman—Pittsburgh Chapter) has been with Jones & Laughlin since 1936, and was previously on the staff of the Aluminum Co. of America Research Laboratories.

Both of the men appointed as trustees are well known to A.S.M. members. Walter Edwin Jominy, who was recipient of the Sauveur Achievement Award last fall, was the subject of a biographical appreciation in the May issue of METAL PROGRESS; John Chipman has been a prolific contributor to TRANSACTIONS, was a Howe medalist in 1934, and Campbell Memorial lecturer in 1942.

Metallurgy of Carbides Described

Reported by R. E. Christin
Metallurgist, Columbus Bolt Works

Malcolm F. Judkins, chief engineer, Firthite Division, Firth Sterling Steel Co., gave an illustrated talk on "Machinability and Metallurgy of Cemented Carbides" before the Columbus Chapter on May 8. High points of Mr. Judkins' talk included the conservation of carbides in tools and the influence of finish on shells during the war program. The importance of carbides in the victory in Europe and the coming victory in the Pacific was emphasized.

Harry L. Sain, superintendent, Safety and Hygiene Division, Industrial Commission of Ohio, was the coffee speaker.

Conference on Light Metals Scheduled in West

A two-day conference on the light metals industry of the west is scheduled to be held by the Western States Council in Seattle on June 21 and 22. Attention will be directed to the spectacular wartime development of the light metals industry and its post-war maintenance and operation under private ownership in the 11 western states.

What's NEW . . . . . in THE METALS REVIEW

Review of Current Metal Literature

Other Departments

PASS-A-ROUND

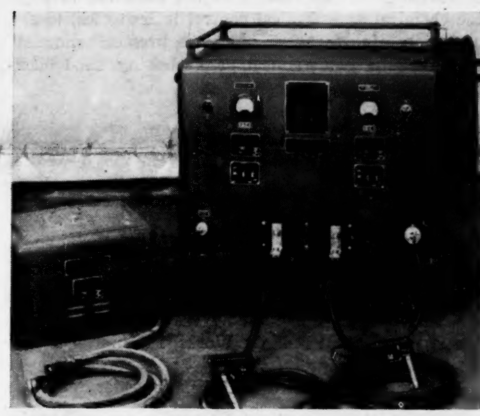
	Name	Item No.
Many executives in your plant will want to see this record of what happened last month in the metal industry. Just fill in the names, note items for special attention — and Pass-A-Round.		

New Magnaflux Unit Detects Deeper Sub-Surface Flaws

A new magnetic particle inspection unit particularly well suited for the inspection of welds, castings, large forgings, and machinery parts has been added to the line of equipment manufactured by the Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill. It is recommended for general use in foundries, welding shops, oil refineries, and shipyards.

Utilizing a radically different electrical design from previous Magnaflux units, the KH-2 permits detection of deeper sub-surface discontinuities and enables one to destinguish between laminations and segregations in rolled plate. Welds designed with open roots can be inspected without interference of non-relevant indications. It may be used to locate shrinkage cracks, hot tears, blow holes, and porosity, in castings; thermal cracks, lack of penetration and fusion, slag inclusions, and other discontinuities in welds; laps, bursts, and cold shuts, in forgings; and fatigue cracks in machinery parts.

The design of the KH-2 Magnaflux unit is based on both practical experience and extensive laboratory



research. Minimum size, weight, and maintenance with extreme durability are featured. It furnishes half-wave, single-phase, rectified outputs for d.c. magnetization and also high-amperage, low-voltage a.c. for both magnetization and demagnetization. It is extremely versatile, the manufacturers state, and requires no auxiliary equipment except the Magnaflux powder blower.

Additional information and a complimentary copy of the article "Routine Inspection and Salvage of Machinery Weldments," by James W. Owens, may be had upon request.

Mention R952 When Writing or Using Reader Service

Additional New Products on pages 17 and 19

Illinois Institute of Technology Installs Corrosion Research Laboratory

To meet the need for an educational and research center for corrosion studies in this country a Corrosion Research Laboratory was recently established at Illinois Institute of Technology, Chicago. H. J. McDonald, associate professor of chemistry, has been appointed director of the new laboratory. At present the most extensive project under investigation is a study of the stress corrosion of mild steel.

The war has been responsible for an increased interest in corrosion, according to Dr. McDonald, caused by the shortage of materials, the difficulty of replacement and the severe corrosion attack of semi-tropical climates. The problem will become of even greater importance in the post-war period when many thousands of tons of intricately built equipment will be stored in government warehouses for immediate call on notice of from 30 days to perhaps 20 years. The corrosion protection measures involved will be on an unprecedented scale.

Forging Advances Centered In Control and Heat Treatment

Reported by P. H. Tomlinson
Farrell-Birmingham Co., Inc.

New Haven Chapter A.S.M. entertained executives of its 40 sustaining members at the regular monthly meeting March 15. Carl A. Gray, the energetic, public-spirited president of the Grenby Manufacturing Co. and Newton Thompson Co., as well as director or chairman of numerous war employment agencies, explained the highlights of his plan for returning veterans and displaced war workers.

R. W. Thompson, sales engineer, Transue and Williams Steel Forging Corp., described "New Developments in Ferrous and Non-Ferrous Forging Practice."

Many advances have been made in the science of steel forging especially in the control and heat treatment of the material. Little basic change has been made in power hammers during the past 25 years, but the heating furnace changes have been almost revolutionary.

Mr. Thompson pointed out that these careful controls produce superior forgings by controlling grain flow to increase strength and that improved design engineering and dies make it possible to produce forgings of a complexity that was impossible just a few years ago.

Steel, brass, aluminum and magnesium all employ similar forging procedures with modifications to adapt the standard procedure to the peculiar requirements of the material being forged. Aluminum, for instance, has a much higher friction coefficient than steel and requires about twice the hammer power. Magnesium, on the other hand, cannot be forged into as thin sections as aluminum.

Regardless of material, close attention to design detail such as providing adequate fillets will greatly increase die life and consequently lower the cost.

Mr. Thompson concluded his lecture with a technicolor movie showing the various stages in the forging operation from the receipt of the material, through the chemical and physical control laboratories, to the shears, heating furnaces, hammers, presses, trimmers, and the subsequent annealing, quenching, sand blasting and Magnafluxing operations.

Bolt Materials Require Certain Minimum Hardenability

Reported by George H. Taylor
Chief Inspector, LaPlant-Choate Mfg. Co.

"Bolts—Materials, Treatments, and Properties" was the subject of the April meeting of the Cedar Rapids Chapter A.S.M., addressed by A. S. Jameson, works metallurgist, West Pullman Works, International Harvester Co., Chicago.

Mr. Jameson pointed out that in order to obtain maximum tensile strength, bolts should be made from medium grades of carbon steel which can be heat treated to obtain a minimum of Rockwell C-45 at the center of cross-section. When the medium carbon steels do not have enough hardenability to obtain this minimum, alloy steels should be used in order to obtain tensile strength equal to surface hardness.

Severe quenching of low hardenability steels, in order to raise Rockwell hardness to required tensile strength values, is normally poor practice since it increases susceptibility to quench cracks.

Engineers, Mr. Jameson stated, frequently express the mechanical properties of bolts in pounds, whereas metallurgists prefer the term pounds per square inch. The difficulty with the latter is that there is not complete agreement as to the proper cross-section which should be used as the area. Universal adoption of a specific cross-section so that mechanical properties may be expressed in pounds per square inch is desirable.

Osborn Illustrates Broad Application Of Induction Heating in War and Peace

Reported by John N. Lynn
Rustless Iron and Steel Corp.

"Induction Hardening at War and at Peace" was discussed in a most interesting manner by Harry B. Osborn, Jr., director of research of Tocco Division of Ohio Crankshaft Co., at the March meeting of Baltimore Chapter.

In introducing the subject the speaker gave a clear description of the mechanics of induction heating and the range of frequencies and power requirements. A number of applications including the type of equipment, shape of part, along with the depth of hardness and Rockwell values that were obtained, were presented to illustrate the broad application of this recent development in the field of metal heating.

Lost Wax Casting Adopts Jewelry Skills For Mass Production

Reported by Horace Ross
Henry Disston & Sons, Inc.

An intriguing picture of how skills long known to the jewelry and dental trades have been enlarged and adapted to critical war production was presented to the Boston Chapter when A. W. Merrick, chief metallurgist, Austenal Laboratories, Inc., spoke on "Precision Casting."

For those accustomed only to the conventional foundry practice here was a wholly new story. It dealt with a metal pattern to start and then with a metal

Extreme interest in the subject of "Precision Castings" is evidenced in this photograph of Boston Chapter members querying A. W. Merrick, chief metallurgist, Austenal Laboratories, Inc., following his talk before the March meeting.

mold to provide duplicates in wax of the original metal pattern. Groups of the wax patterns are then set up with sprues, gates and risers, all in wax, to produce multiples of the part desired from a single mold.

Molds Invested Under Vibration

Such groups, placed within a metal ring as a container, are "invested" under vibration with the refractory material of the mold. This refractory material may vary from the plaster of paris common to the dental casting trade but depends largely upon an organic silicate used as a binder. When "investment" of the mold is completed it is set aside to undergo a chemical set in which the binder plays a part. Following this the mold is raised to a red heat by which the wax of the pattern group is melted, volatilized, and any traces of it decarburized when the mold is ready for casting. Thus is derived the term "lost wax method" used in describing this casting process.

The casting may then be done by centrifugal casting of pairs of molds or casting of individual molds from small crucibles heated by indirect arc. In the latter case arrangement is often made to pour the metal under slight pressure to fill the mold completely.

Stainless Steels Offer Problems

Materials especially adaptable to precision casting procedure are high melting point ferrous alloys, some of the Stellite family, some steels, brass, bronze, monel, beryllium-copper and aluminum. SAE steels and stainless steels offer problems in carbon loss and carbon pick-up which are yet to be fully controlled.

Several factors determine the choice of precision casting. Size and shape are controlling factors. Castings from a fraction of an ounce to a little over a pound have been successful. Large flat surfaces are difficult. Appropriate applications appear in alloys which are difficult to machine or forge; in designs which are difficult to machine; in very intricate shapes; and in development work where molds, dies and forgings may be too costly to consider for production of small quantities.

The coffee talk was given by Sanford A. Moss, consultant of General Electric Co. and inventor of the turbo-supercharger. He showed that, by providing high temperature alloys to function at 1800° F. and developing precision casting technique for producing great numbers of small parts from such alloys, metallurgy has contributed much to the skill of the inventor which made possible the high-altitude, daylight, precision bombing for which our Air Forces are deservedly noted. Finally a challenge was offered to metallurgists to provide a metal capable of functioning at temperatures of 2100° F. or higher since the applications of such a metal are present or in sight.

Three Testing Tools Promote Strength Thru Lightness Trend

Reported by G. F. Kappelt
Assistant Metallurgist, Bell Aircraft Corp.

Because of three new tools for physical testing, the postwar world will see a decided trend toward "strength through lightness" in design. These three tools were explained to the members of the Buffalo Chapter at its March meeting by Francis G. Tatnall, manager of testing research, Southwark Division, Baldwin Locomotive Works.

The three major tools for postwar testing will be the strain gage, brittle coatings, and structural fatigue machines.

Mr. Tatnall showed how the airplane is one of few fully stress-analyzed structures in common use today. It is the airplane manufacturer who has made extensive use of the strain gage and brittle coatings to insure even distribution of loads in all members, to remove that material which was carrying zero load, and to insure the use of the full yield strength of the material. To exemplify this, Mr. Tatnall followed through the designing and testing of structures which contain a maze of lightening holes, yet carry a greater load than a solid component.

In this connection Mr. Tatnall showed the Buffalo Chapter just how foolish it is to overcome service failures by the so-called "beef-up" method. This system of rigidizing structures only leads to lower pay loads and more numerous service failures in another section of the unit.

The uses of brittle lacquer for static test work were explained along with the application of strain gages for both static and dynamic testing. Mr. Tatnall told about methods in use for rapid switching and recording of strain gage circuits.

The third tool, the structural fatigue machine, which applies regulated high loads at resonance, enables the design engineer to eliminate in the laboratory the stress raisers which cause failure in service.

Distinguishing Characteristics Of Tool Steel Types Shown

The problem of tool steels must be studied from two aspects, S. C. Spalding, metallurgical engineer, the American Brass Co., Waterbury, Conn., told the Montreal Chapter of the A. S. M. when he addressed the April 2nd meeting on "Application and Heat Treatment of Tool Steels." These considerations are the requirements of the tools, and the properties of the various tool steels available.

Mr. Spalding classified tool steels into six broad classes: Carbon tool steels; alloy tool steels; high carbon, high chromium and air hardening die steels; hot work tool steels; and high speed tool steels. The carbon tool steels are still by far the most widely used; they are good all-round steels, easy to handle, and harden to limited depth, thus providing a tough, resilient core.

The alloy tool steels harden in oil, and consequently show less distortion than the carbon steels. The high carbon, high chromium and air hardening die steels stand wear to a large extent and heat to a limited extent. The hot work steels are marked by their ability to retain their toughness and strength when working on hot metal. The high speed steels retain their hardness and continue to cut metal although the temperature of the cutting edge of the tool may reach as high as 1100° F.

The effect of each element on tool steels was reviewed, and Mr. Spalding concluded his paper by showing examples of a few tools, punches and dies, and discussing the reasons for selecting a particular steel for each.

The meeting opened with the showing of a colored sound film, "Only a Gasket," produced by the Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Steel Tubing Used in Recoil Mechanism Of Field Artillery Saves Drilling

Seamless steel tubing for the hydro-pneumatic recoil mechanism on field artillery pieces has simplified and speeded up production of guns, according to Peter D. White, vice-president and general manager of the Babcock & Wilcox Tube Co. The use of tubes supersedes the old method which involved cold drilling, by hand lathes, through a solid steel bar 6 to 7 ft. long. It required about 8 hr. to machine the hole in the center. Special rotary piercing machinery now makes the hole in the tube in 5 sec.

The tubing is made of NE steels, measures 2 to 7 in. in diameter, and has very thick walls. It is shipped in 25-ft. lengths which are cut to individual pieces of 4 to 7 ft.

Changes at Penn State Involve Noted Educators

Retirement of D. F. McFarland after 25 years' service as professor and head of the department of metallurgy at Pennsylvania State College was announced recently. In recognition of his long and distinguished service, Dr. McFarland was guest of honor at the Annual Mineral Industries Dinner held at State College on May 19.

C. R. Austin, who has been professor of metallurgy at Penn State since 1934, has also resigned to accept an appointment as assistant to the president of the


D. F. McFarland


C. R. Austin


M. Gensamer

Meehanite Metal Corp., New Rochelle, N. Y. At Penn State Dr. Austin developed and directed a cooperative program of research in metallurgy in association with several well-known steel and metallurgical companies. He was formerly in charge of metallurgical research for the National Tube Co., Pittsburgh, and later served as section engineer for Westinghouse Electric Corp.

A new addition to the staff at Pennsylvania State College is Maxwell Gensamer, who becomes professor of metallurgy and head of mineral technology. Dr. Gensamer comes to Penn State from Carnegie Institute of Technology, where he started in 1929 as a graduate student and research assistant in the metals research laboratory. He began teaching in 1935 and since 1943 has held the rank of full professor.

All three of these educators have been influential members of the American Society for Metals and have contributed liberally to its technical proceedings. Professors Gensamer and McFarland have served on the A.S.M. national Publications Committee, of which the former was chairman in 1943-44. Dr. Austin is currently a member of the national Educational Committee. Dr. Gensamer is a past member of the executive committee of the Pittsburgh Chapter and Dr. McFarland has been secretary-treasurer of the Penn State Chapter since its formation in 1934.

Timken Promotes Horger To Chief Engineer, Railway Div.

New chief engineer of the railway division of the Timken Roller Bearing Co., Canton, Ohio, is Oscar J. Horger, who has a 20-year record with Timken in this field and was formerly in charge of railway engineering and research.


O. J. Horger

Dr. Horger has a B.S. degree from Carnegie Institute of Technology and D.Sc. from University of Michigan, where he instituted and was in direct charge of a program of research on fatigue testing in locomotive and car axles. He also received a degree in Mechanical Engineering and Master of Science and Engineering from Michigan.

His name is familiar to all who follow the technical literature in the fields covered by the American Society for Metals, the American Society of Mechanical Engineering, the American Society for Testing Materials, and the Society for Experimental Stress Analysis.

At the same time C. L. Eastburg, who is in active charge of the design of bearings and parts as applied to locomotives, has been appointed assistant chief engineer of the railway division. P. C. Paterson, who has been active in the inspection and procurement of material and in equipment applications, will be service manager of the railway division.

Will Manage Export Division of Copperweld Steel

Copperweld Steel Co., Warren, Ohio, has announced the appointment of A. Hugh Philpot as vice-president and managing director of the newly formed export division known as Aristoloy Steel International Co. in Washington, D. C. In addition to being managing director of the export division, Mr. Philpot continues to be assistant to the president of Copperweld Steel Co. He maintains his headquarters in Washington.

Compliments

To the New Jersey Chapter of the American Society for Metals on its John F. Wyzalek Memorial Awards, and to the five outstanding students of New Jersey technical and vocational high schools who received the cash prizes and certificates this year; namely, Frederick Roemer from the Newark school, Joseph Camburo from Irvington, Roderick Griffith from Bloomfield, Eugene Tkac from Bayonne, and Edward Harwelick of Thomas A. Edison school in Elizabeth.

* * *

To O. T. Muehlemeyer of O. T. Muehlemeyer Heat Treating Co., Rockford, Ill., on his special lectures and demonstrations of heat treatment presented gratis every Friday afternoon to the metallurgy students at Mackay School of Mines, University of Nevada, Reno.

* * *

To Richard G. Byrne, formerly on the advertising and production staff of Metal Progress, now serving with the U. S. Navy in the Pacific, on his promotion in rank from lieutenant (j.g.) to full lieutenant.

* * *

To Bissett Steel Co., Cleveland, and George Bissett, president, on the celebration of its 25th anniversary in the steel warehouse industry.

* * *

Wide Variations in Application Demand Forging Skill

Reported by Don Sener
Assistant Research Engineer, Harrisburg Steel Corp.

Knowledge of the application is the determining factor for all steps in the manufacture of a forging, W. Homer Gilmore pointed out when he addressed the final technical meeting of the York Chapter at Harrisburg, Pa., on "Steel Forgings." Mr. Gilmore is assistant superintendent of the Forge Department, Midvale Steel Co., Philadelphia.

The chemical analysis prescribed in the open-hearth, the size and type of ingot mold, the rolling in the blooming mill (if necessary), the heating before forging, and the mechanical method of forming are all factors dependent upon each other and controlled by the final application of the part. Considering that the finished article may vary in weight from several pounds to as high as 600,000 lb., that stresses may vary from 1000 or 2000 psi. to over 100,000, and that the analysis may run the gamut of SAE and NE steels, the forging processes are, of necessity, the working tools of highly skilled individuals.

Although forging processes may be divided into five classes—steam hammering, hydraulic pressing, drop forging, extrusion, rolling and drawing—Mr. Gilmore limited his talk to the first two methods.

The main difference in the action of the hammer and press is that the press gives a steady pressure with deep penetration, whereas the hammer produces a sudden blow which is quickly dissipated. Also, the piece at the hammer is usually hand manipulated in contrast to mechanical manipulation under a press.

Because many forgings are stressed in use to a high degree, it is of the utmost importance to keep the center of the slab or ingot where it will get the least stress.

Mr. Gilmore's talk was amply supplemented with numerous slides of typical and special forgings produced at Midvale.

Tool Design, Materials, Heat Treat Covered by Stagg at Puget Sound

Reported by Harry P. Evans
Metallurgist, Boeing Aircraft Co.

An overflow crowd of considerably over 100 members and guests attending the April meeting of the Puget Sound Chapter were amply repaid by the exceptionally well presented discussion on "Tool Design With Relation to Tool Steels," presented by Howard J. Stagg of Crucible Steel Co. of America. The lecture covered the proper and improper design of tools, the selection of suitable materials for each design, and the proper heat treatment for the tool.

An excellent group of slides illustrated examples of poor design and factors which would remove dangers of excessive warpage and cracking during heat treating. Emphasis was laid on the use of the T-T-T curve and the advantages of heat treating in the salt bath.

Test Devised for Piercing Ability Of Seamless Tubing

Reported by Eugene V. Ivanso
Metallurgical Engineer, Steel Sales Corp.

Two main steps are involved in the manufacture of seamless tubing—the hot working phase wherein the tubular shape is formed, and the cold working phase in which the tube is brought to size and the desired finish and physical properties are imparted. Details of these processes were clearly presented to the Detroit Chapter A.S.M. on April 9 by H. K. Ihrig, director of laboratories, Globe Steel Tubes Co., speaking on "Modern Methods of Manufacturing Seamless Tubing and Scientific Means of Controlling Such Manufacture."

Of the four principal hot working methods for making tubular shapes, the rolling-piercing or Mannesmann process is the one most generally used. Here certain hot working properties of the metal determine whether or not a good tube is made, particularly with respect to the all-important inside surface of the tube.

Various tests have been investigated to find one which could correlate piercing ability with certain inherent properties of any given billet. Dr. Ihrig's laboratory has developed a hot torsion test which is particularly suited for this purpose and this comparatively simple procedure is now used as a standard operation in checking each heat before the billets are pierced. For research purposes this method also affords an ideal method for studying the effect of varying composition, temperature and other factors on hot workability.

After the tube has been formed by hot working methods, it is drawn to size either by pulling through a die and over a mandrel, or through a die with a removable bar inside the tube. The rate of work hardening of the particular metal in question determines the extent of reduction possible before annealing must be performed.

In stainless steel the rate of cold drawing can only be about 10% that of ordinary steel and presents various other difficulties such as galling upon the mandrel. To minimize galling, Dr. Ihrig's company has developed a lubricant which is actually an adhesive, namely a mixture of shellac, alcohol and lithopone.

The extent to which seamless tubing can be drawn is strikingly exemplified by stainless steel hypodermic needle tubing in which the outside and inside diameters are of the magnitude of 0.035 and 0.025 in. respectively.

W. O. Binder Speaks at Worcester On Stainless and Heat Resistant Steels

Reported by John R. Dobie
Heat Treat Foreman, American Steel & Wire Co.

William O. Binder, metallurgist, Union Carbide and Carbon Research Laboratories, Inc., Niagara Falls, N. Y., spoke before Worcester Chapter, American Society for Metals, in the Sheraton Hotel, April 11, on the "Application and Heat Treatment of Stainless and Heat Resistant Steels."


W. O. Binder

Chester T. Reed, president of Reed & Prince Mfg. Co., told the chapter of the background of his company in the development of Worcester and Worcester industries.

Arnold L. Rustay was program chairman, and J. Adams Holbrook, vice-chairman, presided.

Powdered Metal Machine Parts Break Serious Production Bottlenecks

Reported by E. W. Marshall
Chief Inspector, Ottawa Car & Aircraft, Ltd.

The principal speaker at the last meeting of the season of the Ottawa Valley Chapter, held on May 1, was G. E. Platzer, chief engineer, Amplex Division, Chrysler Corp., Detroit, who spoke on "Machine Parts Made From Powdered Metals."

This subject, which has come to the forefront considerably during the war, provided an opportunity to hear some amazing results in breaking serious bottlenecks in vital production. The discussion which followed produced some interesting facts, such as that instrument parts which formerly required 4½ hr. to machine can now be made in 45 sec. by this process.

A.S.M. REVIEW OF CURRENT METAL LITERATURE

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month. Prepared by Thelma Reinberg, Librarian.

1. ORES & RAW MATERIALS

Production; Mining; Beneficiation

1-16. **The Coinage Metals in Antiquity, III.** Douglas Rennie Hudson. *Metallurgia*, v. 31, March '45, pp. 249-252.

Critical review of metal extraction and craftsmanship, since the third millennium B.C., of Phoenicia and deals with metalliferous mining in Spain, silver and other metals; scripts; Phoenician metallurgy, bronze, ras shamra, byblos and includes a consideration of the vigorous metal culture of South Russia.

1-17. **The Combination Process for Alumina.** Junius D. Edwards. *Metals Technology*, v. 12, April '45, T.P. 1833, 5 pp.

Bayer process, lime-soda process, and Alcoa combination process utilizing high silica bauxites and employing a sintering operation as a cyclic step in the Bayer process.

1-18. **Alumina-From-Clay Plant at Salem, Oregon.** C. K. White. *Mining Congress Journal*, v. 31, April '45, pp. 32-34.

Demonstration plant now under construction will employ the ammonium bisulphate process for the first time on a commercial scale. This is one of the important steps being taken in the development of the aluminum industry in the northwest.

2. SMELTING AND REFINING

2-52. **Magnesium From Olivine.** E. C. Houston. *Metals Technology*, v. 12, April '45, T.P. 1828, 14 pp.

Describes a process developed through the pilot-plant stage, whereby magnesium chloride suitable for reduction to metallic magnesium can be prepared from olivine by extraction with hydrochloric acid and subsequent purification. 13 ref.

2-53. **Production of Magnesium at Painesville, Ohio.** J. M. Avery and R. F. Evans. *Metals Technology*, v. 12 April '45, T. P. 1829, 8 pp.

Production of magnesium by the electrolytic process, using steam-electric power supplied by a public utility.

2-54. **The Plant of the Dow Magnesium Corp. at Velasco, Texas.** C. M. Shigley. *Metals Technology*, v. 12, April '45, T.P. 1845, 9 pp.

Unquestioned weight advantage of the magnesium alloys, coupled with their ease of fabrication and good corrosion resistance, make the future of magnesium look very bright. Past struggle will be considerably eased by the well-demonstrated feasibility of its recovery from sea water. 5 ref.

2-55. **Pilot-Plant Production of Electrolytic Magnesium From Magnesia.** R. R. Lloyd, C. K. Stoddard, K. L. Mattingly, E. T. Leidigh, and R. G. Knickerbocker. *Metals Technology*, v. 12, April '45, T.P. 1848, 25 pp.

Magnesium cell can be operated continuously at a reasonable current efficiency. $MgCl_2$ concentration in the electrolyte must be maintained above 55% to permit desired suppression of chlorine. Major cause of sludge formation in the cell is ascribed to plating out of colloidal MgO at the cathode. Presence of iron in the bath results in the plating out of metallic iron on the magnesium globules formed at the cathode. 18 ref.

2-56. **Investigations on the Recovery of Vanadium From Slags.** J. Klarding. *Archiv fur das Eisenhüttenwesen*, v. 17, Jan.-Feb., '44, pp. 153-157. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 121-A.

The influence of the form of pretreatment and of the chemical composition of vanadium slags on the facility with which the vanadium can be leached out with acids was investigated. The amount leached out was increased by raising the temperature of the roasting pretreatment and by increasing the proportion of silica in the slag mix before roasting.

2-57. **Melting and Pouring for Magnesium and Aluminum Alloys.** Alexander McIntosh. *Aluminum & Magnesium*, v. 1, April '45, pp. 16-19, 33-34.

Care of furnace; melting; stirring; after stirring; dusting; fluxes; melting and pouring of aluminum alloys; procedure for melting aluminum; standard pouring procedure for all metals.

2-58. **Magnesium Production, II.** D. D. Howat. *Chemical Age*, v. 52, March 24, '45, pp. 259-264.

Developments in thermal reduction processes. 15 ref.

2-59. **Acid Steel Castings.** *Canadian Metals & Metallurgical Industries*, v. 8, April '45, pp. 42, 46.

Melting and molding practice at Vulcan Iron Works.

2-60. **Slag Control.** N. H. Bacon. *Iron & Steel*, v. 18, April '45, pp. 124-127.

Improving basic open-hearth furnace performance. 9 ref.

2-61. **Steel Ingots, IV.** E. Barber. *British Steelmaker*, v. 11, April '45, pp. 166-171.

Why ingots are tapered; extent of taper; ingot length; pouring hints; mold coatings; ladle influence; mold bottoms; preheating the ingot; the feeding head casing; ingot reduction; extent of reduction.

2-62. **Charging Electric Steel and Other Furnaces.** *British Steelmaker*, v. 11, April '45, pp. 176-178.

To accomplish furnace charging quickly, mobile type box chargers have been developed. (*Metallurgia*, v. 31, March '45, p. 257.)

2-63. **Melting 80% Ferromanganese in Cupolas.** John Howe Hall. *Foundry*, v. 73, May '45, pp. 107, 195-196, 198, 200.

Description of development of the process.

2-64. **Soda Briquettes in the Steel Industry.** *Chemical Age*, v. 52, April 7, '45, pp. 312-313.

Sulphur reduction in iron.

2-65. **Eastern Open-Hearth Steelmakers Discuss Operating Problems.** *Steel*, v. 116, April 30, '45, p. 102.

Scheduling furnaces for rebuilds; bottom repairs; tap hole repair; method of storing brick; furnace control equipment; fuel burners; colloidal fuel; deoxidation; pit practice; cleanness of killed steel.

Materials Index

THE FOLLOWING tabulation classifies the articles annotated in the A.S.M. Review of Current Metal Literature according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

2-66. **Making Swedish Pig Iron.** R. P. Donogh and D. B. Stough. *Foreign Commerce Weekly*, v. 19, May 12, '45, pp. 10-13, 47-50.

Growth of iron industry; early production processes; introduction of pig iron; Elektrometall furnace; other electric furnaces; grades of pig iron; direct reduction processes; ferro-alloys; wartime developments; wartime cost increases.

3. PROPERTIES OF METALS AND ALLOYS

3-72. **True Stress-True Strain Diagrams, II.** *Metal Industry*, v. 66, March 30, '45, p. 197.

Search for fundamental relationships. 3 ref.

3-73. **Beryllium Copper.** E. R. Yarham. *Iron Age*, v. 155, April 26, '45, pp. 63-67.

To the extensive amount of general data which has been published in recent years is added this contribution from British sources, presenting much specific data on mechanical and physical properties of an alloy which has considerable post-war application possibilities.

3-74. **The Shape of a Material's Reactions to Force, I.** A. C. Vivian. *Metallurgia*, v. 31, March '45, pp. 225-229.

Conceptions of properties; tensile compression and shear tests; loading differences; measuring strain; hardness, toughness, and fatigue endurance; special tests for materials; one true curve; features of the true curve.

3-75. **Beryllium Copper.** *Metallurgia*, v. 31, March '45, pp. 247-248.

Characteristics and properties of a beryllium-copper alloy, Cu.B.250.

3-76. **Stainless Steels—Basic Types.** *Metals & Alloys*, v. 21, April '45, pp. 1033, 1035.

Martensitic and ferritic. AISI type; composition; hardening temperature; properties and uses.

3-77. **The Rare Metals Go to Work and to War.** H. A. Bolz. *Modern Machine Shop*, v. 17, May '45, pp. 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154.

Familiarity with known properties and characteristics of less common elements by all engineers and production men will lead to quicker and more effective utilization of these properties for the betterment of war equipment and post-war products.

3-78. **Comparative Properties of Cast and Forged Steel.** C. E. Sims. *Foundry*, v. 73, May '45, pp. 90-93, 192, 195.

Compares the properties of forged and centrifugally cast aircraft engine cylinder barrels, especially in fatigue. Centrifugally cast barrels from two heats of steel and forged barrels from one heat of steel were procured in the rough machined condition. Compositions of the three heats given.

3-79. **Copper and Copper-Base Alloys.** J. W. Donaldson. *Metal Industry*, v. 66, April 20, '45, pp. 242-244.

Review of American investigations and researches during 1944. 13 ref.

3-80. **Temper Brittleness and Heat Embrittlement of Alloy Steels.** P. B. Michailow-Michejew. *Archiv für das Eisenhüttenwesen*, v. 17, Jan.-Feb., '44, pp. 177-180. *Bulletin* Iron & Steel Institute, no. 111, March '45, p. 137-A.

An investigation is reported on the influence of the hardening and tempering temperatures, the tempering time, the cooling rate after tempering, a prolonged second tempering, cold deformation and the chemical composition on the temper brittleness and heat embrittlement of low alloy steels. The brittleness was determined by notched-bar impact tests at room temperature as well as between —200° and +500° C. The specimens were cut from chromium-nickel and chromium-nickel-molybdenum steels. Temper brittleness and heat embrittlement are phenomena of similar nature and can be regarded as related to the embrittlement which occurs at low temperatures. This brittleness results from the steel remaining for a considerable time in a critical temperature range the extent of which depends upon the tempering time and the chemical composition; the phenomenon often occurs at between 400 and 550° C. It can be prevented by alloying the steel with elements which impede the shifting of the brittle range to higher temperatures. An addition of molybdenum to chromium-nickel steels acts in this way. The susceptibility of chromium-nickel steels to heat embrittlement can be reduced by holding them at a high temperature (up to 650° C.) for at least 24 hr., provided that this treatment does not raise the cold-embrittlement temperature range to room temperature.

3-81. **On the Kinetics of the Formation of Oxide Films on the Surface of Metals.** J. Frenkel. Academy of Sciences of U.S.S.R., *Journal of Physics*, v. 8, no. 4, '44, pp. 225-229. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 141-A.

A mathematical study of the dissociation of adsorbed oxygen molecules into atoms and the rate of penetration of the atoms into the surface of metals is presented.

3-82. **Previewing the Future for Low Alloy, High Strength Steels.** F. D. Foote. *Steel*, v. 116, April 25, '45, pp. 102-104.

Careful re-examination of equipment, machinery and structures is in order where there is the possibility of redesigning for higher efficiency and longer service life to be found in improved low-alloy steels.

3-83. **Lowering of the Photoelectric Work Function of Zirconium, Titanium, Thorium and Similar Metals by Dissolved Gases.** H. C. Rentschler and D. E. Henry. Electrochemical Society. Preprint 87-14, April 16, '45, 10 pp.

It is well known that the photoelectric threshold of certain metals such as caesium, barium, thorium, etc., is shifted toward the longer wave length when the metal reacts with oxygen. Describes experiments which show a photoelectric threshold shift due to the interaction of oxygen, nitrogen or hydrogen with zirconium, titanium, etc. The results indicate that the lowering of the photoelectric work function is caused by the formation of a solid solution of the gas in the metal.

3-84. **Metal Lusters: Their Characteristics and Limitations in Vacuum Tube Applications.** S. F. Essig. Electrochemical Society. Preprint 87-16, April 16, '45, 12 pp.

Physical and chemical characteristics of certain typical lusters, under conditions applying in special vacuum tube applications, are discussed. For most applications, flux-free lusters are not suitable, primarily because of the poor adherence of the final film. The commercially available flux-bearing variety may be the source of contamination due to the presence of volatile inorganic compounds. Also, because of the composite character of these films, they may not be stable under conditions common in vacuum tube practice.

3-85. **The A-B-C of Corrosion and Heat Resisting Steels.** *Metal Progress*, v. 47, May '45, p. 936-B.

Chart showing types; analysis; heat treatment; toughness; structural changes at high temperatures; strength at elevated temperatures; working qualities; machinability; riveting; welding properties; corrosion resistance; scaling resistance.

3-86. **Aluminum Bronzes (Materials Work Sheet).** *Machine Design*, v. 17, May '45, pp. 145-149.

Analyses; properties; characteristics; applications; fabrication; heat treatment; annealing and pickling; resistance to corrosion; galvanic corrosion.

4. STRUCTURE

Metallography and Constitution

4-17. **Standards for Identifying Complex Twin Relationships in Cubic Crystals.** C. G. Dunn. *Metals Technology*, v. 12, April '45, T.P. 1796, 8 pp.

Method of computing orientation of a twin. 6 ref.

4-18. **Orientation Changes During Recrystallization in Silicon Ferrite.** C. G. Dunn. *Metals Technology*, v. 12, April '45, T.P. 1797, 16 pp.

Preparation of specimens and experimental procedure; experimental results; analysis and interpretation of results. 6 ref.

4-19. **A New Microscopy and Its Potentialities.** Charles S. Barrett. *Metals Technology*, v. 12, April '45, T.P. 1865, 50 pp.

A fine-grained photographic plate placed in contact with or very close to the specimen to be examined, and a beam of characteristic X-rays striking the specimen. Images formed on the plate by diffraction can be enlarged to useful magnifications up to 100 or perhaps to 250 diameters. X-ray diffraction micrographs show the places where inhomogeneous strain is concentrated. Sizes and shapes of polycrystalline grains are nicely shown. Cold-worked structure persists throughout the recovery period during annealing. 19 ref.

4-20. **X-Ray Diffraction.** F. G. Firth. *Petroleum Refiner*, v. 24, April '45, pp. 114-120.

Discusses the basic principles of the X-ray. These rays have a wave length "of the same order as the basic repeating structures of matter." Matter is a condition of atomic arrangement. Consequently the X-ray has its place as a tool for examination.

4-21. **Segregation.** *Metal Industry*, v. 66, April 13, '45, pp. 230-231.

Mechanism of solidification; liquid and solid diffusion. 1 ref.

4-22. **Softening of Cold Worked Aluminum.** J. K. Stanley. *Aluminum & Magnesium*, v. 1, April '45, pp. 20-23, 33.

Softening in cold worked aluminum; strain hardening and softening; recovery; recrystallization; grain growth. During the heating of the cold worked aluminum two processes occur. First, the aluminum goes through a recovery period in which most of the internal stresses are relieved and where there is a slight change in hardness. Aluminum can undergo recrystallization by which strain free nuclei grow in the cold worked matrix. The phenomenon results in an isothermal recrystallization curve which is governed by the cooperation of the rate of nucleation and the rate of growth. Large changes in hardness occur during recrystallization. The aluminum after recrystallization on prolonged annealing, particularly at elevated temperatures, undergoes a change in grain size due to grain growth. This growth becomes very aggravated at temperatures above 500° C. especially if the material is pure and long annealing times are used.

4-23. **Mode of Occurrence of Lead in Lead-Bearing Steels and the Mechanism of the Exudation Test.** W. E. Bardgett and R. E. Lismer. Iron & Steel Institute. Advance Copy, March '45, 13 pp.

Extensive examination carried out on high-sulphur and manganese-molybdenum wrought steels and on 0.25% carbon, 1% manganese steel ingots, to find out the mode of occurrence and distribution of lead. Normal methods of microscopic examination failed to reveal the presence of lead as discrete particles, but an electrolytic method revealed particles believed to be lead, not visible in unetched specimens. A new electrographic method is described which produces a clear pattern of the lead or lead-bearing particles in the ingot section.

4-24. **Examination of Two Ingots of Free-Cutting Steel, One Containing Lead and the Other Lead-Free.** C. S. Graham. Iron & Steel Institute. Advance Copy, March '45, 3 pp.

Segregation in an ingot of leaded steel has been compared with that in a non-leaded ingot from the same cast. Little difference in the chemical compositions was found at the Heterogeneity of Steel Ingots Committee's standard positions, with the exception of a small, but possibly significant, reduction in the oxygen content in the lead-bearing ingot. The lead itself was evenly distributed, except at the extreme bottom of the ingot. On the examination of an axial section, the leaded ingot showed less segregation of sulphur and a thinner columnar zone.

4-25. **The Microscopical Examination of Samples of Lead-Bearing and Lead-Free Steels and Ingot Irons.** T. H. Schofield. Iron & Steel Institute. Preprint, March '45, 4 pp.

Microscopical examination of samples of lead-bearing steels and ingot irons has revealed small characteristic inclusions which are not present in similar lead-free materials. Using a modified polishing technique, these inclusions appear white, and an etching test indicates that they consist of or contain lead. The inclusions are removed by mercury at 100° C. 9 ref.

4-26. **A Graphic Method for Determining Rates of Solidification.** M. Hampl and V. Vodicka. *Archiv für das Eisenhuttenwesen*, v. 17, Jan.-Feb., '44, pp. 185-191. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 124-A.

A rather complicated equation has been developed by Gröber for calculating solidification rates and the depth to which a substance will solidify in a given time under given conditions. In this paper curves are presented which enable the equation to be solved in a few minutes, and examples are given of their application to determine the freezing rates of water and of liquid steel, as well as the progress of solidification in steel when in contact with a wall of infinite thickness of either cast iron or fireclay.

4-27. **Transformation in Ferrous Alloys.** C. J. Osborn. *Australian Institute of Metals: Australasian Engineer*, v. 44, Dec. 7, '44, pp. 26-29. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 140-A.

Transformations in ferrous alloys and the effects of different alloying elements explained by reference to equilibrium diagrams and transformation-temperature-time curves. Additions of all alloying elements, except cobalt, retard the decomposition of austenite; this is due partly to the necessity for diffusion of the slower-diffusing alloying element. The only other major effect is that of the carbide-forming elements in increasing the reaction time in the range of about 500° to 600° C. The explanation of this phenomenon is not known, but it is probably related to the stability of the carbides of the alloying elements.

4-28. **An Electron-Diffraction Study of the Atmospheric Oxidation of Aluminum, Magnesium, and Aluminum-Magnesium Alloys.** L. de Brouckere. *Journal* Institute of Metals, v. 71, March '45, pp. 131-147.

Character of films formed on aluminum, magnesium, and aluminum-magnesium alloys has been examined by electron diffraction (a) after standing in air at room temperature, (b) after heating in air at temperatures up to the melting point, and (c) after melting. On abraded aluminum and 8% magnesium-aluminum alloys, the film formed at room temperature is less than 100 A. thick. The film on aluminum which has been melted consists of crystalline gamma Al_2O_3, although rapid heating to 700° C. for short times gives a mixture of the amorphous and gamma-oxides. Aluminum heated at temperatures between 400 and 500° C. for a comparatively long time carries a film of gamma Al_2O_3, but rapid heating to 500° C. for short times causes the formation of an amorphous alumina film. It is suggested that the formation of alumina is determined by the relative speeds of oxidation and crystallization. Magnesium and 35% magnesium-aluminum alloy carry comparatively thick films of magnesia after any treatment. The film is amorphous when formed at room temperatures, but becomes crystalline on heating above 200° C. Aluminum-magnesium alloys containing up to 8% magnesium carry a thick film of MgO after melting, but on heating to temperatures between 120 and 350° C. are covered with crystalline gamma Al_2O_3. Heating above 350° C. causes the formation of a surface film of MgO and progressive heating up to 400° C. causes a duplex film of magnesia superimposed on alumina to form. The black film sometimes formed on these alloys has been shown to consist of magnesia. 27 ref.

4-29. **Micro-Examination of High Silicon Irons.** J. E. Hurst. *Iron Age*, v. 155, May 17, '45, pp. 59-61, 153.

The "barley shell" structure observed in the micro-examination of iron-silicon alloys is the subject of further study. The conclusion is that these strange markings are not the true structure of the alloys or specimens. These structures can also be produced in silicon-free specimens with etching reagents having some silicon content.

5. POWDER METALLURGY

5-16. **Metal-Powder Friction Materials.** Clyde S. Batchelor. *Metals & Alloys*, v. 21, April '45, pp. 991-993.

Sintered metallic friction materials in forms and sizes once considered impossible are today serving ruggedly in brake linings, clutch rings and faces, automatic transmission plates, etc. Characteristics, present uses and future prospects of these important powder metallurgy products. (Originally presented at the Cleveland meeting of the Metal Powder Association.)

5-17. **Iron in Powder Metallurgy.** R. J. Traill. Canadian Institute of Mining and Metallurgy *Transactions*, v. 47, Dec. '44, pp. 490-500. Iron and Steel Institute *Bulleton*, no. 111, March '45, p. 122-A.

The economic aspects of iron powder metallurgy are reviewed. The advantages and disadvantages of using powders prepared from electrolytic iron, and by the gaseous reduction of iron oxide and from mill scale, are discussed. The results of tests on bars containing 0.5% of carbon, all pressed at 60,000 psi., indicate that those made from electrolytic iron have greater tensile strength, elongation and density than those made from hydrogen-reduced iron.

5-18. **The Relationship Between the Production of Iron Powders and the Properties of Powder Metallurgy Products.** W. Dawihl and U. Schmidt. *Stahl and Eisen*, v. 65, Jan. 4, '45, pp. 9-14. Iron and Steel Institute *Bulletin*, no. 111, March '45, pp. 121-A-122-A.

The results of investigations of the porosity, strength, and other properties of powder metallurgy products made of iron powders produced by several different processes are discussed and compared. The porosity and structure were examined by micrographs at high magnification, and microhardness tests were made. The effects of the manufacturing process are still quite marked, even after sintering at 1450° C. The pores in parts made from powders of iron that has been melted are uniformly distributed, while the distribution is not uniform if the iron has not been melted (e.g., powder from sponge iron). If the powder has been subjected to severe deformation (e.g., when made by the cold-stamping of sheet iron) this has a detrimental effect on the sintering properties and on the growth of the ferrite. The microhardness readings indicated that the uniting of the crystals gave rise to additional stresses called sintering stresses; these stresses were probably the cause of the change in microhardness with the method of producing the powder. Additional time and power consumption in making the powder can in some cases be compensated by simplification in the finishing processes; for instance, when a compact is made from a powder produced by directing two streams of particles one against the other, sintering only is required to produce a soft and easily deformed part, whereas, with powders made by other methods, forging and recrystallization are necessary to produce the same deformability.

5-19. **Copper Powder.** A. W. Hothersall and G. E. Gardam. *Metal Industry*, v. 66, April 13, '45, pp. 234-236.

Commercial preparation by electrodeposition. Determines the most suitable conditions for the production of copper powder on a pilot plant scale. (Electrodepositors' Technical Society.)

5-20. **Particle Size Analysis of Iron Powders in Powder Metallurgy.** Harold H. Steinour. *Iron Age*, v. 155, May 17, '45, pp. 65-71.

Comparisons of the particle size analysis of five commercial iron powders obtained by the Wagner turbidimeter method, originally developed for portland cement analyses, show close agreement in four out of five cases with computed recombinations of the fractions. Specific surface values obtained by the air permeability method reported for the five commercial powders and some others. A sixth commercial iron powder composed of spherical particles tested and gave a value consistent with microscopic measurements reported by the manufacturer.

6. CORROSION

6-46. **Corrosion of Nickel-Chromium-Iron Alloys.** *Alloy Casting Bulletin*, No. 4, March '45, pp. 1-7.

Influence of nickel and chromium content on penetration rates in air and flue-gas at high temperatures.

6-47. **A Variable Cycle Alternate Immersion Corrosion Testing Machine.** C. H. Mahoney, A. L. Tarr, and K. A. Skeie. American Society for Testing Materials *Bulletin*, no. 133, March '45, pp. 16-17.

Cycle machine tests up to 48 specimens or clusters of specimens in separate glass solution containers which are heated by a common thermostatically controlled bath. The specimens, suspended from the rack by means of glass stirrups, are raised and lowered alternately by a sprocket chain attached to a motor-driven cam. The immersion and aeration periods are automatically controlled by means of independent time switches which permit variations in the periods ranging from a few seconds to ½ hr.

6-48. **Glass Tanks for Pickling and Plating.** George L. West. *Metals and Alloys*, v. 21, Feb. '45, pp. 413-416.

Reports on the service properties and some applications of glass-lined and all-glass tanks, embodying a new high-strength and thermal shock resistant glass, for handling corrosive solutions in the metal working industries. The glass will thus be a competitor of corrosion resistant alloys for those jobs and for chemical process industries equipment as well.

6-49. **Memo on Cavitation.** Frank N. Speller. American Society for Testing Materials *Bulletin*, no. 133, March '45, pp. 21-22.

Definition, causes, and effects. 17 ref.

6-50. **Emulsions of Oil in Water as Corrosion Inhibitors.** P. Hamer, L. Powell and E. W. Colbeck. Iron & Steel Institute Advance copy, Feb. '45, 18 pp.

Investigation undertaken to prevent corrosion in recirculating cooling-water systems, which was begun as a result of plant failures. Origin and object of the work discussed, together with the factors influencing the choice of experimental method. The oil emulsions referred to are those produced by adding "soluble oils" to water. These resemble the cutting oils employed on machine tools. Attention has been chiefly directed to the prevention of attack on mild steel.

6-51. **The Comparative Effect of Carbon and Nitrogen on Intergranular Corrosion of 18-8 Stainless Steel.** Herbert H. Uhlig. Electrochemical Society Preprint 87-13, April 16, '45, 14 pp.

Effect of high nitrogen in 18-8 stainless steel on susceptibility to intergranular corrosion is of an order of magnitude less than that of carbon. Results, although possibly explained by nitride precipitation, call for a more comprehensive theory of intergranular corrosion than any based on precipitation of a chromium nitride or chromium carbide as an *a priori* factor in the mechanism. This is indicated by definite intergranular corrosion of an austenitic 18% Cr, 24% Ni, balance Fe alloy, heat treated at 500° C. (930° F.) for 169 hr. and exposed to $CuSO_4 + H_2SO_4$ solution, despite a carbon and nitrogen content of 0.004% and 0.006% respectively. The mechanism of corrosion in this alloy and in 18-8 appears to involve grain boundary precipitation of a metallic phase.

6-52. **Relationships Between Corrosion and Fouling of Copper-Nickel Alloys in Sea Water.** F. L. LaQue and Wm. F. Clapp. Electrochemical Society, Preprint 87-15, April 16, '45, 20 pp.

Exposure of a series of copper-nickel alloys in natural sea water, under conditions which permitted detailed observations of the relationships between fouling and corrosion, disclosed that: In order for fouling to be prevented, copper must be released in corrosion products at a rate greater than 4.5 to 7 mg. per sq. dm. per day. Acceleration of corrosion by fouling organisms began in the early stages of fouling and was quite noticeable within 11 days after fouling had appeared. Alloys that fouled showed increases in corrosion rates when fouling developed as the period of exposure was prolonged. The results suggested that the sloughing off of solid corrosion products must be considered, along with toxicity, as a major factor in determining the fouling characteristics of metals and alloys in sea water.

6-53. **An Apparatus for Measuring Corrosion.** Morris Cohen. Electrochemical Society, Preprint 87-19, April 16, '45, 6 pp.

An apparatus has been developed for measuring the corrosion resistance of metals in solutions. Results of experiments are presented, which show good reproducibility. To illustrate the usefulness of the apparatus, the effect of time and the effect of three different waters on the corrision of steel are reported.

6-54. **Pipe Service Tests on Baltimore Water.** Charles F. Bonilla. Electrochemical Society Preprint 87-20, 17 pp.

Pitting of black and galvanized wrought iron and steel pipe carrying cold water, hot water, and returning condensate.

6-55. **Galvanic Corrosiveness of Soil Waters.** Howard S. Phelps and Frank Kahn. *Electrical Engineering*, v. 64, April '45, pp. 156-159.

Results of a study of the relation of pH of soil waters to galvanic action between couples of lead, copper, iron, and carbon. Galvanic-cell tests were made using as electrolytes actual soil waters or soil extracts from 31 locations at which trouble had been experienced. 3 ref.

6-56. **Cathodic Protection of Steel Surfaces in Contact with Water.** Lee P. Sudrabin. *Water Works & Sewerage*, v. 92, May '45, pp. 147-151.

Application of cathodic protection frequently presents a complex engineering design problem for successful results and economy; a comprehensive survey of the corrosion environment is the only recommended procedure. Any steel surface submerged in natural waters can be protected when an adequate current density, projected from a properly designed anode configuration within the corroding media is properly distributed. 14 ref.

6-57. **A Rapid Demonstration of Metaphosphate Protection.** A. A. Hirsch. *Water Works & Sewerage*, v. 92, May '45, p. 156.

Heavily chlorinated water samples furnished an effective medium to demonstrate the protection against corrosion afforded by sodium hexametaphosphate. Amount of rust formed seems the better evidence of protection. At high chlorine concentrations, all specimens of steel wool rust despite high metaphosphate dosage, but the rate of corrosion is retarded by increasing the metaphosphate treatment. 2 ref.

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Ray T. Bayless..*Editor*
M. R. Hyslop................................*Managing Editor*

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Lancaster Bomber Described, Production Figures Given

Reported by G. L. White
Editor, Canadian Metals & Metallurgical Industries

"Canadian designers, boys educated at Canadian universities, have designed many jigs for production of the Lancaster bomber which have been copied by aircraft plants in the United States and Britain," David Boyd, general manager, Victory Aircraft, Ltd., Malton, Ont., told the Ontario Chapter of the American Society for Metals on April 6.

Discussing the country's aircraft industry, the speaker said that in 1938 it employed 3,000 workers, and by 1944 this had increased to 84,000. These figures refer to the manufacturing branch only. During the war Canada has produced 10,000 aircraft of all types.

Describing some of the difficulties encountered in producing the Canadian Lancaster, Mr. Boyd said that the plant received instructions to proceed in January 1942. Nineteen months later the first plane was finished, and a heavy backlog of orders for other types of aircraft was cleaned up.

The Lancaster required 30,000 drawings covering over 33,000 different parts. In the plane are 11 miles of electric wiring and 4,000 sq. ft. of aluminum alloy sheet.

The speaker stated that aircraft production cannot be compared with other industries from a mass production standpoint. Tooling principles are different because of the small number of components required. The location, set-up and use of machine tools cannot be operated on an assembly line basis such as, for example, the motor car industry.

U. S. Steel Official Addresses Largest Crowd of Calumet Season

Reported by John B. Segada
Metallurgist, Youngstown Sheet & Tube Co.

Edmund S. Davenport, assistant to the vice-president in charge of research and technology for the U. S. Steel Corp., presented an interesting and informative talk on "Isothermal Transformation in Steel" before the April meeting of the Calumet Chapter A. S. M. With the aid of slides he lectured on the S-curves of a number of NE steels and showed how isothermal heat treatment can be predetermined from the S-curve of any particular grade.

The new projector recently purchased by the chapter was used in showing a Navy Signal Corps picture entitled "Retaking of Guam."

Heat Treating Photographs Wanted

Interesting and striking action photographs of heat treating operations are needed by the editor of METAL PROGRESS. Payment of $5.00 each will be made for any photographs submitted by an A.S.M. member that are accepted. Those that are not suitable will be returned promptly.

Glossy prints 7x10 in. in size are preferable but not essential. Photographs should be sent to E. E. Thum, editor, METAL PROGRESS, 7301 Euclid Ave., Cleveland 3, Ohio.

Salkover Appoints Terwell, Announces New Service

Salkover Metal Processing, commercial electric furnace copper brazing firm, with plants in Chicago, and Long Island City, N. Y., announces the appointment of Elmer A. Terwell as assistant manager of its Chicago plant.

E. A. Terwell

Mr. Terwell was connected for 20 years with the Chicago office of The Driver-Harris Co., and also served as secretary-treasurer of the Chicago Chapter, American Society for Metals, for the four-year period 1938 to 1941.

Lawrence Jacobsmeyer, manager of the Chicago plant of Salkover Metal Processing, who is currently an official of the Chicago Chapter A.S.M., recently announced the entrance of Salkover into the field of design and method consultation for electric furnace copper brazing. This new service is intended chiefly to assist companies located so far from the Salkover plants that shipment is impracticable. For the time being this service will be available only from the Chicago plant.

L. Jacobsmeyer

Tool Failures Discussed, Proper Quenching Stressed

Reported by H. H. Hewitt, Jr.
Steel Tank and Pipe Co.

The engineering department, the metallurgical department, and the mechanics in the operating department all come in for their share of the blame when tools fail, Howard J. Stagg of the Crucible Steel Co. of America told the Oregon Chapter A.S.M. on April 20. The engineering department may fail to design properly, the metallurgists may select the wrong steel or specify the incorrect heat treatment, or the mechanics may be blamed for improper usage and sharpening.

After giving some of the common causes of tool failure, Mr. Stagg explained the T-T-T or S-curves for different types of steels, showing in detail the importance of the different steps in heating, cooling and tempering of tool steels. He paid particular attention to the speed necessary for quenching in order to pass the nose of the T-T-T curve for different types of steels; a steel should be taken down to a temperature where it can be easily handled to be certain that the maximum martensitic transformation has taken place on the quench and cooling prior to drawing.

In practice there is usually considerable retained austenite in high speed steel after quenching and cooling prior to drawing; this is transformed to martensite during the cooling from the first draw. In order to develop maximum properties it is necessary to draw again to temper this last percentage of martensite.

Battelle Expands Research Education

With the impending return of many young men and women from the armed services to civilian life, Battelle Memorial Institute, Columbus, Ohio, will expand greatly its program of research education. Fellowships will be available to highly qualified graduate students on a basis that will permit them to learn the philosophy and to practice the methods of modern highly organized research, while also deriving the usual benefits of graduate work in their own university.

These Battelle fellowships, after 15 years of successful operation at Ohio State University, will now be made available in a number of other institutions of higher learning. J. Robert Van Pelt, formerly technical director of the Museum of Science and Industry, Chicago, will assume responsibility for this expanded program of research education.

Tool Steels Subject of Ottawa Meeting

Reported by E. W. Marshall
Chief Inspector, Ottawa Car & Aircraft, Ltd.

S. C. Spalding, metallurgical engineer, American Brass Co., Waterbury, Conn., addressed the monthly meeting of the Ottawa Valley Chapter on April 3. His subject, "Application and Heat Treatment of Tool Steels" is reviewed briefly on page 2 of this issue. G. S. Farnham acted as chairman and N. McPhee proposed a vote of thanks to the speaker.

Explains Mechanism of Quench and Temper In High Speed Steels

Reported by W. T. Rubin
Metallurgist, Copperweld Steel Co.

A lecture on "High Speed Steels" was presented before the Warren Chapter on April 16 by James P. Gill, vice-president of Vanadium-Alloys Steel Co. It was emphasized by the speaker that the carbide segregate usually present in the cast structure of high speed steel should be broken up to as great an extent as possible by rolling or forging so that proper hardening and minimum brittleness may be realized during later treatments. It was also emphasized that a temperature high enough to eliminate the ferrite constituent be used for hardening, but that this temperature be low enough to prevent the formation of liquid during austenitization.

The mechanism which takes place during the quenching and tempering of high speed steels was explained, and it was shown that it is very important to temper at the highest possible temperature, because if the tempering temperature is too low, the M-point of the residual austenite will be close to room temperature and therefore a considerable portion of the austenite will transform as the steel approaches room temperature on cooling. At this low temperature the steel is less capable of accommodating the movement accompanying this reaction, resulting in high internal stresses and breakage. The speaker recommended that high speed steels be double tempered to relieve the internal stresses formed upon the transformation of austenite to martensite during cooling after the first temper.

The speaker stated that the austenite grain size at the time of quenching has a profound influence on the cutting properties and toughness, and advocated a fine grain size for best performance.

Cutting ability, he said, is the most important requisite of high speed steels; this property is dependent upon red hardness, wear resistance and toughness. The speaker therefore related the role of each of the commonly used alloying elements which are used to impart these properties to high speed steels.

As the tungsten increases, the amount of complex carbide and the amount of tungsten dissolved in the austenite increase. Tungsten also causes resistance to tempering.

In conjunction with the carbon content, chromium is mainly responsible for the high hardenability of high speed steel. Chromium also imparts secondary hardness to high speed steels and retards softening at elevated temperatures.

Vanadium increases the cutting efficiency of high speed steels, but above a certain percentage of vanadium the hardness decreases rapidly. It is significant that as the vanadium content increases the carbon content is likewise increased.

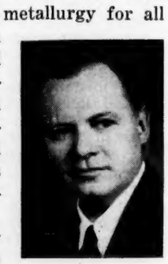
Molybdenum can be substituted for tungsten in high speed steel, but its tendency to cause decarburization and to lower the melting temperature has restricted its uses. Molybdenum forms the same type of double carbide as does tungsten.

Cobalt increases the hot hardness of high speed steels and thus increases the cutting efficiency at high tool temperatures.

In conclusion, the speaker stated that cold treatment of high speed steels is successful only for extremely difficult applications, and that cold treatment does not add anything where normal operations are concerned.

John A. Comstock Is Research Director For H. K. Porter and Subsidiaries

H. K. Porter Co., Inc., has appointed John A. Comstock as director of research and metallurgy for all Porter Divisions. He will be in charge of the central research and testing laboratory located in Pittsburgh. While Mr. Comstock will maintain technical advisory service for customers on materials and metallurgy, his prime purpose is to develop new and improved products in the varied Porter lines.



J. A. Comstock

Mr. Comstock served previously as engineering metallurgist with the United Aircraft Corp. of East Hartford, Conn. He has had directive experience with several concerns including Peoples Gas Co., Chicago, in metallurgical and materials processing lines. He is an active member of the American Society for Metals, and served as secretary-treasurer of the Chicago Chapter for several years.

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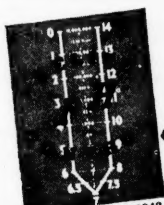

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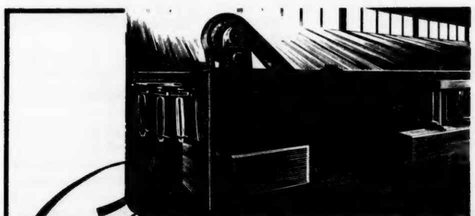

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Metal Literature Review

7. CLEANING AND FINISHING

7-71. Methods of Polishing Steel and Their Effects Upon the Protective Value of Electroplated Coatings. Gerald A. Lux and William Blum. *Journal of Research*, v. 34, April '45, pp. 295-324.

To determine whether the "finish" of steel prior to electroplating affects the protective value of the plated coatings, strips of cold-rolled steel were polished with wheels to which abrasives of different grain size were glued. The resultant finishes were measured with a profilometer. Polished specimens were plated with copper, nickel, and chromium of controlled thickness, and exposed. Extent of rusting observed at periodic inspections was expressed on a numerical scale, and the average results over a period such as one year were expressed as "percentage scores." Results with accelerated tests, such as the salt spray, hot water, feroxyl, and condensation tests, were not as reproducible and consistent as the atmospheric tests.

7-72. Metal Cleaning: 1—Indirect Performance Tests. Jay C. Harris. American Society for Testing Materials *Bulletin*, no. 133, March '45, pp. 23-28.

Reviews test methods to make them available for future use, to indicate the extent to which such tests are resorted to in defining qualities of cleaning compositions, and to develop constructive criticism. Cleaning processes are classified as these general types: Soak tank cleaning; mechanical tank or spray cleaning; electrolytic cleaning; solvent or vapor degreasing; emulsion degreasing. Available analytical methods and specifications outlined. Performance tests which are considered, and their general applicability given. 29 ref.

7-73. Pickling in the Vitreous Enamelling Industry. N. Swinden. *Foundry Trade Journal*, v. 75, April 5, '45, pp. 273-279.

Development of mass production and the chemistry and physics of pickling. 4 ref.

7-74. Resin Coatings Baked by Induction Heating. A. P. Mazzucchelli and R. E. Nicolson. *Iron Age*, v. 155, May 3, '45, pp. 46-50.

Baked phenolic coatings on pipe have demonstrated great resistance to corrosion in use. The application of induction heating to the continuous baking of resin coated pipes shows commercial practicability and many advantages over conventional baking methods. Other uses of induction heating for the curing of resin coatings on metal are discussed.

7-75. The Composition of Abrasive Products. Henry R. Power. *Modern Machine Shop*, v. 17, May '45, pp. 180, 182, 184, 186, 188, 190, 192, 194.

Method for critically examining the physical structure of abrasive compositions.

7-76. Pumping Acid Solutions. Edward W. Mulcahy. *Sheet Metal Industries*, v. 21, April '45, pp. 620-625, 630.

The rotary coil pickling machine; tube pickling machine; importance of fume extraction; the acid egg; the air lift; automatic air-pressure pump; jet pumps; centrifugal pumps; acid pipework.

7-77. Trend in Aluminum Cleaning. Jay C. Harris. *Aluminum & Magnesium*, v. 1, April '45, pp. 28-32.

Alkaline cleaning; neutral cleaning compositions; acid cleaning compositions; rinsing; patent literature; corrosion inhibitors; recent specifications; laboratory technic. 17 ref.

7-78. Cleaning Metal With New Oxidizing-Reducing Process. G. W. Birdsall. *Steel*, v. 116, May 7, '45, pp. 104-106, 130, 132, 134, 136.

Process removes colloidal graphite, facilitating subsequent porcelain enameling of deep drawn sheet steel parts; cleans out residual core sand from castings, permitting casting designs heretofore impracticable; makes possible good silver soldered or brazed joints, between cast iron and steel (or other metals) for the first time; prepares cast iron surfaces so they "tin" easily, thus extending use of high-lead babbitts in heavy duty bearings; employs a single electrically activated molten salt bath to handle many other difficult surface preparation jobs.

7-79. Application and Selection of Organic Finishes. C. R. E. Merkle. *Steel*, v. 116, May 7, '45, pp. 108-109, 176, 178, 185-186, 188, 190.

Selection of special finishes to meet the criteria of performance required in protecting and decorating sheet metal parts is simplified by the detailed analysis of factors affecting service functions presented, along with the most effective techniques for proper application of suitable finishes.

7-80. Symposium—Cleaning Steel. Nelson E. Cook, J. J. Duffy, J. I. Greenberger, and Lane Johnson. *Iron & Steel Engineer*, v. 22, April '45, pp. 53-60.

Cleaning steel for subsequent coatings; electrolytic cleaning lines; a modern strip pickling plant.

7-81. Vapor Degreasing Aluminum Parts. E. P. Troeger. *Products Finishing*, v. 9, May '45, pp. 32-34, 36, 38, 40.

Description of process and operation.

7-82. Protective Treatments for Magnesium Alloys. Jerome L. Bleiweis and A. J. Fusco. *Metals and Alloys*, v. 21, Feb. '45, pp. 417-434.

Provides a correlated review of virtually all the protective surface treatments developed to date, with data on the methods and materials used in each process; detailed and comparative information given on the techniques and applicabilities of the more common chemical surface treatments and on the plating and painting of these alloys; how magnesium corrodes and corrosion control by composition modification. 30 ref.

7-83. Symposium on Surface Finish. *Machinery* (London), v. 66, March 22, '45, pp. 318-321, March 29, '45, pp. 345-348.

Surface finish on production methods, by W. E. R. Clay. Results of modern practice, by F. Nourse. Principles and methods of surface measurements, by R. E. Reason.

7-84. Symposium on Surface Finish: Continuity in the Production of Specified Surface Finish. E. Swain. *Engineering*, v. 159, March 30, '45, pp. 258-260.

If a ground or honed finish is to be improved, the matter resolves itself into moderate finish with accuracy and speed of operation, as against fine finish, with slow operation coupled with the danger of generating excessive temperature, and its consequences.

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A.S.M. Review of Current Metal Literature — *Continued*

7. CLEANING & FINISHING (*Cont.*)

7-85. **Protection of Magnesium Alloys by New Anodizing Process.** N. H. Simpson and P. R. Cutter. *Aviation,* v. 44, May '45, pp. 150-153.
Aircraft weight savings are held feasible through expanded use of light weight metal made possible by a protective coating which not only gives good corrosion resistance but withstands rough handling and service.

7-86. **Symposium on Surface Finish.** W. Ker Wilson. *Engineering,* v. 159, April 6, '45, pp. 277-280.
Effect on fatigue strength.

8. ELECTROPLATING

8-51. **Bright Zinc Plating.** S. Wernick. *Sheet Metal Industries,* v. 21, April '45, pp. 626-629.
Preparation of the cathode surface; advantages of bright zinc plating; electrolytic polishing of zinc; bright cadmium plating; acid electrolyte. 10 ref.

8-52. **Electroplating: Modern Equipment and Technique.** H. Silman. *Sheet Metal Industries,* v. 21, April '45, pp. 675-681.
Cadmium plating; plating solution; cadmium plating practice; effect of impurities; anodes; after-treatment of cadmium deposits; lead plating; types of baths; the fluoborate bath; some characteristics of the solution; addition agents; alternative baths; resistance to corrosion. 12 ref.

8-53. **Selecting Plated Coatings.** H. L. Farber. *Products Finishing,* v. 9, May '45, pp. 42-44, 46, 50, 52.
Factors involved in determining the kind of metal to be deposited and the finishing system to be used, including the use to which the product is to be put, the base material to be finished, the cost of finish to be used, and the facilities required.

8-54. **Science and Electroplating.** E. W. Cox. *Monthly Review,* v. 32, April '45, pp. 349-351.
Types of conductors; theory of electrolysis; throwing power.

8-55. **Nomograph for Determining Amperage and Time of Plating.** John S. Hart. *Monthly Review,* v. 32, April '45, pp. 359, 365.
Calculations for determining the time and current required to plate an article are tedious when carried out often, and errors are frequently made. To eliminate calculations and errors, nomograph has been worked out. Calculations of the current for and time of plating are based on area, current density, metal plated and bath efficiency, and thickness of deposit required.

8-56. **Analysis of Impurities in Plating Baths. Progress Report No. 1.** *Monthly Review,* v. 32, April '45, pp. 367-370.
A bibliography of modern methods of isolating and determining metallic impurities. References chosen which describe procedures most adaptable to nickel plating baths.

8-57. **Hard Chrome Plating.** N. N. Sawin. *Metal Industry,* v. 66, March 30, '45, pp. 202-204.
Review of current German practice. (Translated from "Metallwaren-Industrie u. Galvanotechnik.")

8-58. **Protective Coatings on Metals.** W. J. Blanch. *Australian Institute of Metals: Australasian Engineer Science Sheet,* Nov. 7, '44, pp. 11-16. Iron & Steel Institute *Bulletin,* no. 111, March '45, p. 130-A.
Descriptions are given of methods of plating steel and cast iron with cadmium, zinc, tin, nickel and chromium, and of spraying with aluminum, zinc and tin. Some weathering and corrosion resistance tests are also discussed.

8-59. **Palm Oil Recovery System.** H. P. Wilkinson. *Steel,* v. 116, April 23, '45, pp. 90-91, 112, 115.
In Weirton Steel Co.'s tin plate department; 25% reduction in purchases of new oil, savings in tin and improved quality of plate through elimination of "fish eyes" and other flaws are the results.

8-60. **Fluorescent Lamp Problems Challenge the Electrochemist.** Richard G. Slauer. Electrochemical Society Preprint 87-18, April 16, '45, 7 pp.
Theoretical; costs; fluorescent glass.

8-61. **The Fundamentals of Chemistry for Electroplaters, XVIII.** Samuel Glasstone. *Monthly Review,* v. 32, April '45, pp. 363-365.
Hydrolysis of salts.

8-62. **The Deposition of Metals From Fluoborate Solutions.** Harold Narcus. *Metal Finishing,* v. 43, May '45, pp. 188-190, 199.
Methods of procedure, operating conditions and characteristics of metal fluoborate baths, whose "concentrates" are commercially obtainable from several sources discussed. These include the lead and lead-tin alloy baths and the tin, cadmium, zinc and indium fluoborate solutions.

8-63. **Laboratory Control of Plating Operations.** *Metal Finishing,* v. 43, May '45, pp. 200-201.
Plant layout of Michigan Chrome and Chemical Co. which operates a complete plating plant including bright chromium, hard chromium, copper (rochelle and high speed) cadmium, tin, silver, nickel, bronze and other metals.

8-64. **Plating With Up-to-Date Facilities at Adel.** Gerald Eldridge Stedman. *Metal Finishing,* v. 43, May '45, pp. 202-204.
Quality control in machining, processing and plating at the Burbank, Calif. plant of Adel Precision Products Corp.

9. PHYSICAL AND MECHANICAL TESTING

9-46. **Improved Methods for Calculating Torsional Vibration, II.** Robert H. Scanlan. *Machine Design,* v. 17, May '45, pp. 141-144.
For calculating higher modes of torsional vibration, three possible methods discussed. 8 ref.

9-47. **Beam Design in the Curvilinear and Plastic Ranges of Stress.** A. Fisher. *Metallurgia,* v. 31, March '45, pp. 241-247.
Interest is being shown in the differences between practical results and present theory as applied in the plastic ranges of stress. Discusses some basic principles of curvilinear-stress-strain characteristics and emphasizes a general feeling that the time is ripe for a re-examination of the bending and torsional theories, particularly the former. 8 ref.

9-48. **The Yielding Phenomenon of Metals, III.** Georges Welter. *Metallurgia,* v. 31, March '45, pp. 263-268.
Influence of speed and loading conditions.

9-49. **Relation Between Life Testing and Conventional Tests of Materials.** R. E. Peterson. American Society for Testing Materials *Bulletin,* no. 133, March '45, pp. 9-16.
Fundamentals of life testing; fatigue problem; creep of metals.

9-50. **The Influence on Tensile Strength of the Inclination of Weld-Seams to the Direction of Loading.** H. Zschokke and R. Montandon. *Schweizer Archiv,* v. 10, no. 5, 1944, pp. 129-137. *Engineer's Digest* (American Edition), v. 2, April '45, pp. 191-194.
To find experimentally for various seam efficiencies, that angle of inclination of the seam which results in the greatest static tensile strength.

9-51. **Effect of Bead Contour on Fatigue Life of Arc Welds.** George W. Harvey and Harry Campbell. *Product Engineering,* v. 16, May '45, pp. 306-307.
Fatigue failures were found to occur in arc welded lap joints of stainless steel after short periods of service. Weld beads having an abrupt change of section or sharp radius at the foot of bead had low fatigue life. The rewelding of beads by atomic hydrogen produces a more gradual slope of the weld bead and increases fatigue life.

9-52. **Shear and Tension Loads on Countersunk Bolts and Screws.** T. Rieben. *Product Engineering,* v. 16, May '45, pp. 308-313.
Discussion of allowable shear loads in single and double-lap joints, the effect of bolt or screw head bearing in joint tension, and allowable tension loads on nuts. Results are presented in tabular form and an analysis is made of the types of countersunk bolt and screw failures.

9-53. **Notch Fractures.** *British Steelmaker,* v. 11, April '45, pp. 156-163.
Judgment by fracture.

9-54. **Stresses and Deflections in Crankshafts Used in Mechanical Presses Revealed by Graphic Analyses.** Henry A. Weyer. *Modern Industrial Press,* v. 7, April '45, pp. 22, 24, 44.
Study of press failures due to breakage of crankshafts.

9-55. **A Study of the Tensile Properties of Heavy, Longitudinally Welded Plate Specimens Simulating Deck and Shell Joints.** Leon C. Bibber. *Welding Journal,* v. 24, April '45, pp. 193s-226s.
Observes the mode and extent of flow in ordinary commercial heavy mild steel plates of known tensile properties in the form of specially shaped, welded and variously conditioned tensile specimens. 3 ref.

9-56. **The Notched-Bar Impact Test.** John H. Hollomon. *Welding Journal,* v. 24, April '45, pp. 230s-244s.
Behavior of notched impact specimens. The effects of strain rate, temperature and stress distribution, which are discussed with reference to the impact specimen, apply just as well to the behavior of metal at the bases of notches in any engineering structure. Purpose of study is accomplished by correlating the results of the impact tests with those of tensile tests obtained at various low temperaures and high strain rates. 29 ref.

9-57. **Testing Speed Specifications.** George G. Ernst and Leroy W. Empey. *Iron & Steel,* v. 18, April '45, pp. 116-118.
Influence of rate of loading on tensile and elastic properties. 4 ref. (From *A.S.T.M. Bulletin.*)

9-58. **Theory of Bending, Torsion and Buckling of Thin-Walled Members of Open Cross-Section.** Stephen P. Timoshenko. Franklin Institute *Journal,* v. 239, April '45, pp. 249-268.
Mathematical discussion.

9-59. **Fatigue Failures of Aircraft Parts—Their Cause and Cure.** Daniel M. Davis. *Automotive Industries,* v. 92, May 1, '45, pp. 34-37, 67-68, 72, 74.
Major factors limiting the life of parts subjected to repeated loading are stress concentration, deflection and vibration. Effects of stress concentration generally may be evaluated in terms of three diffrent parameters described.

9-60. **Hardenability Behavior of Carburizing Grades of NE and Automotive Alloy Steels.** A. S. Jameson. *Steel,* v. 116, May 7, '45, pp. 110-114, 116, 118, 120, 192.
Difficulties encountered in testing for hardenability discussed and attention is drawn to differences to be expected in behavior of various alloy combinations.

9-61. **What About Your Test Bars?** *Foundry,* v. 73, May '45, pp. 84-87, 150, 153, 156.
Methods of machining and threading test bars highly important; careless pouring of test bars cuts apparent strength markedly; reproducibility of methods needed in testing and manufacturing.

9-62. **The Effect of the Steel on the Life of Gudgeon Pins.** E. Mickel and P. Sommer. *Archiv für das Eisenhüttenwesen,* v. 17, March-April, '14, pp. 227-234. Iron & Steel Institute *Bulletin* no. 111, March '45, p. 137-A.
A statistical analysis of the causes of the failure of gudgeon pins is presented and their relative importance is discussed. An examination of over 100 failures and the result of fatigue tests in compression indicated that the life of gudgeon pins made of many different alloy steels is approximately the same. The two main causes of failure are slag inclusions and faulty heat treatment. Sand blasting or grinding the inner surface of a pin increases the fatigue strength. While the magnetic powder method is an excellent way of examining the outer surface, there is no really suitable method of testing the inner surface.

9-63. **Fatigue Testing Methods and Equipment.** H. W. Foster and V. Seliger. *Mechanical Engineering,* v. 66, Nov. '44, pp. 719-725. Iron & Steel Institute *Bulletin,* no. 111, March '45, p. 137-A.
The more important considerations in the general design of fatigue testing apparatus, and the methods and equipment developed and now in use at Lockheed Aircraft Corp. are discussed in detail.

9-64. **The Creep of Heat Resisting Steels at Temperatures of 800 to 1200° C.** E. Siebel and G. Hahn. *Archiv für das Eisenhüttenwesen,* v. 17, March-April, '44, pp. 211-220. Iron & Steel Institute *Bulletin,* no. 111, March '45, pp. 137A-138A.
An investigation of the creep strength of heat resisting steels is described. The steels tested included three chromium steels (with 6%, 16%, and 23% chromium respectively), a 23-18 chromium-nickel steel, a steel containing 5% aluminum, 9% chromium and 1% titanium, and one containing 18% manganese, 9% chromium and 1% nickel. A special test apparatus was constructed in which hollow specimens with a gage length of 80 mm., an outside diameter of 8.7 mm. and an inside diameter of 3.5 mm. were heated by their own resistance by a heavy current to temperatures up to 1200° C. for periods up to 1650 hr. A comparison of the loads required to cause a total creep of 1% at 1000° C. in the ferritic steels after 1000 hr. showed a greater superiority of the chromium-aluminum steel; at 900° C. the manganese-chromium steel gave the highest value. Previous treatment of the 16% chromium steel at 1000° C. for 500 hr. increased the creep strength at 900° C. by 250%. The fractures of the austenitic steels were intercrystalline, whatever the temperature and load, while those of the ferritic steels were mostly transcrystalline.

9-65. **On Fatigue Failure Under Triaxial Static and Fluctuating Stresses and a Statistical Explanation of Size Effect.** F. H. Fowler. American Society of Mechanical Engineers *Transactions,* v. 67, April '45, pp. 213-216.
Purpose is to develop a framework for establishing a criterion of safe fatigue characteristics of manufactured units. In addition a statistical theory of fatigue has been indicated. Provision can be made for a study of combined stresses, static and vibratory stresses, and variations in amplitude. Interesting explanations of scale effect and stress gradient effect are given.

9-66. **Self-Indicating Torsion Testing Machines.** *Engineering,* v. 159, April 6, '45, p. 267.
Torsion testing machines embody an interesting utilization of the principles of the compound lever weighing machine, to measure the torque in the test piece set up by the straining gear. Two types of machine described.

10. ANALYSIS

10-27. **Spectroscopic Analysis of Metals.** *Tool & Die Journal,* v. 11, April '45, p. 113.
Spectrographic technique is now standard for aluminum and magnesium alloys and many steels. Spectroscopy can accomplish an accurate analysis in many instances where chemical methods are not sufficient.

10-28. **The Gravimetric Estimation of Silicon in Aluminum Alloys.** G. H. Osborn and J. Clark. *Metallurgia,* v. 31, March '45, pp. 230-232.
Fuchshuber gravimetric method and causes of failure discussed; details of a suggested modification of this method given by which greater accuracy is obtained.

10-29. **Determination of Small Quantities of Nickel in Duralumin.** *Metallurgia,* v. 31, March '45, pp. 261-262.
Study of the factors affecting precipitation of the nickel complex in duralumin and, as a result of experimental work carried out, an improvement on existing methods of determining small quantities of nickel recommended.

10-30. **Desiccants in Microchemical Analysis.** Kenneth C. Barraclough. *Metallurgia,* v. 31, March '45, pp. 269-272.
It is frequently difficult to decide on an appropriate desiccant for any particular operation, and critical comparisons of the properties of the many available desiccants are difficult to find. Wide selection of desiccants discussed with reference to their specific applications.

10-31. **Quantitative Spectrographic Determination of Minor Elements in Zinc Sulphide Ores.** Lester W. Strock. *Metals Technology,* v. 12, April '45, T. P. 1866, 22 pp.
Development of quantitative d.c. carbon arc method; standard concentration curves; speed and extension of the method for determining the more abundant metallic constituents in ZnS. 4 ref.

10-32. **Machining Spectrographic Samples.** C. L. Waring. *Metals & Alloys,* v. 21, April '45, pp. 1013-1014.
Effect of surface preparation on the accuracy of spectrographic analyses demonstrated.

10-33. **Chemical Control.** F. F. Pollak and F. Pellowe. *Metal Industry,* v. 66, April 13, '45, pp. 231-233.
Routine method for the analysis of brass, with methods for aluminum, arsenic, manganese, antimony, phosphorus and zinc. 9 ref.

10-34. **Modification of a Rapid Method for the Determination of Alkaline Earths and Other Metals.** F. C. Guthrie and J. T. Nance. Society of Chemical Industry *Transactions,* v. 64, Feb. '45, pp. 50-51.
Determining alkaline-earth metals by direct titration with sodium carbonate, using phenolphthalein as indicator, made more accurate and rapid if a volume of acetone approximately equal to that of the neutral solution of the alkaline-earth chloride or nitrate is added before starting the titration. The addition of acetone lowers the solubility of the carbonates and prevents the pH of the solutions rising high enough to affect phenolphthalein until the precipitation of the alkaline-earth carbonates is complete. The method has been applied also to the determination of silver, lead and cadmium.

10-35. **New Techniques in Analytical Chemistry.** *Industrial Chemist,* v. 21, March '45, pp. 117-125.
Survey of recent advances. 45 ref.

10-36. **Some Factors Affecting the Precision in Polarographic Analysis.** Floyd Buckley and John Keenan Taylor. Electrochemical Society Preprint 87-17, April 16, '45, 16 pp.
The factors influencing the variables of the Ilkovic equation are analyzed. Tolerances in the control of the experimental conditions are estimated which permit chemical analyses or determinations of diffusion-current constants with a precision of ± 2%. The presence of maxima in polarographic waves and the effect of their suppression on the diffusion current are discussed. Criteria are given for determining when the current is represented by the Ilkovic equation.

Metal Literature Review

10-37. Colorimetric Estimation of Aluminum in Aluminum Steel. C. Howard Craft and G. R. Makepeace. *Industrial & Engineering Chemistry,* (Analytical Edition), v. 17, April '45, pp. 206-210.

Colorimetric estimation of acid-soluble aluminum in steel by means of ammonium aurintricarboxylate in the range 0.04 to 1.5% aluminum. Experimental data given concerning the factors governing the formation, stability, and reproducibility of the aluminum color. Interference of other elements commonly found in steel or likely to be introduced during the analysis discussed in detail. 15 ref.

10-38. Rapid Photometric Determination of Silicon in Low Alloy and Stainless Steels. David Rozental and Hallock C. Campbell. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, April '45, pp. 222-224.

Rapid silicon analysis is described which is ideally suited to the needs of the industrial laboratory. Routine accuracy of $\pm$ 0.02% silicon is achieved without use of blank solutions or buffers. Precalibrated correction graphs are constructed, which permit the use of distilled water as a reference solution. Method is adaptable to many types of colorimetry instruments for rapid routine analysis of alloy and stainless steels. 10 ref.

10-39. Determination of Iron in the Presence of Cobalt. Ernest A. Brown. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, April '45, pp. 228-230.

Colorimetric thiocyanate method is given for the estimation of 0.07 to 0.5 mg. of iron in the presence of variable amounts of cobalt up to 90 mg. Filter-type photometer with two color filters is used to circumvent the interference of the cobalt ion color. Method is rapid with an accuracy of $\pm$ 3%. 8 ref.

10-40. Spectrophotometric Determination of Small Amounts of Copper Using Rubeanic Acid. E. John Center and Robert M. MacIntosh. *Industrial & Engineering Chemistry,* (Analytical Edition), v. 17, April '45, pp. 239-240.

Spectral transmittance curves for copper, nickel, cobalt, and iron in a weak acetic acid solution with rubeanic acid are shown. Fading of the color and maximum permissible amounts of certain elements at 650 millimicrons are indicated. Transmittance vs. copper concentration curves have been prepared for wave lengths of 400 and 650 millimicrons. 10 ref.

10-41. Determination of Copper in Copper Proteins. Stanley R. Ames and Charles R. Dawson. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, April '45, pp. 249-253.

Specific method for the determination of copper in copper proteins involves use of the dropping mercury electrode after an acid extraction of the copper. The base solution for analysis is an acid sodium citrate buffer containing 0.005% fuchsin as a maximum suppressor. The copper can be quantitatively extracted and the presence of native protein and protein breakdown products has been shown to be permissible within prescribed limits. The method therefore eliminates the necessity of a tedious ashing procedure. The half-wave potential at 25.0° C. for cupric ion in the above base solution is —0.18 volt vs. the saturated calomel electrode. The diffusion coefficient at 25.0° C. of the cupric citrate complex in the above medium is equal to 0.43×10^{-5} sq. cm. per $sec.^{-1}$. Practical limits of the method are from 1 to 75 to 100 micrograms per ml. of copper in the base solution with an average deviation of $\pm$ 3%. 34 ref.

10-42. Colorimetric Determination of Minute Amounts of Nickel. Emanuel Passamaneck. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, April '45, pp. 257-258.

Small amounts of nickel, especially in the presence of great excess of iron and other common metals, may be determined by precipitating the nickel dimethylglyoxime from an ammoniacal citrate solution of a small volume of the prepared material, dissolving the precipitate in pyridine, and comparing its color with a known solution of nickel dimethylglyoxime. 11 ref.

11. LABORATORY APPARATUS, INSTRUMENTS

11-25. Electronic Timing for X-Ray Exposures. *Metallurgia,* v. 31, March '45, pp. 259-260.

Photo-electric X-ray timing device enables radiologists and technicians to obtain uniformly dense photofluorographic exposures with an overall increase in operating efficiency, claimed to be about 100%. The electronic timer times each exposure properly, quickly, and automatically.

11-26. Something New in Remote Control. T. J. Kauffeld. *Iron & Steel Engineer,* v. 22, April '45, pp. 61-64.

New system of remote control which has wide possibilities for industrial application.

11-27. Electronics—Photoelectric Control. Clark E. Jackson. *Modern Metals,* v. 1, May '45, pp. 21-24.

Describes the value of electronic control and where it can be used, together with the types of control which can be advantageously employed in the light metal industry.

11-28. Electropolishing of Steel. S. R. Prance. *Steel,* v. 116, April 23, '45, pp. 106, 109.

For microscopic examination.

11-29. "Microptic" Vertical Measuring Machine. E. R. *Engineering,* v. 159, March 30, '45, pp. 246-248.

No multiplying devices, the actual movement of the measuring contact being read directly by means of a microscope. Normal capacity covers measurements from zero to 4 in., the reading being made directly to within 0.00005 in. The accuracy of the instrument may be relied upon under any conditions to within 0.0001 in.

11-30. Electronics of the Mass Spectrometer. John A. Hipple, Don J. Grove and W. M. Hickam. *Electrical Engineering,* v. 64, April '45, pp. 141-145.

Value of the mass spectrometer as an instrument for the quantitative and qualitative measurement of the components of gaseous mixtures is enhanced by a recording system which combines speed of response, accuracy, and extensive range. 7 ref.

12. INSPECTION AND STANDARDIZATION

12-73. New Technique in Gage Control Raises Efficiency, Cuts Costs. E. B. Sarreals. *American Machinist,* v. 89, April 26, '45, pp. 99-101.

Case history of an efficient gage control system proves that properly planned controls can improve production efficiency and raise inspection quality.

12-74. Detection of Flaws by X-Ray Fluoroscopy. H. Witte. *Zeitschrift des VDI,* v. 87, no. 33-34, Aug. 21, '43, pp. 529-534. *Engineers' Digest* (American Edition), v. 2, April '45, pp. 163-164.

Theoretical method to determine the smallest size of flaw, recognizable on the fluoroscopic screen.

12-75. Measuring Piston Bores of High Speed Internal Combustion Engines. A. Moser. *Werkstattstechnik, Der Betrieb,* vol. 37/22, no. 5, May '43, pp. 197-198. *Engineers' Digest* (American Edition), v. 2, April '45, p. 167.

Use of plug gages; testing tools or equipment; results according to area tolerance limits.

12-76. Quality Control Involves Testing and Inspection for Obtaining and Maintaining Uniformity of Quality. *Drop Forging Topics,* v. 10, Feb.-Mar. '45, pp. 1-5.

Definition of quality control; the design stage.

12-77. Surface Finish and Its Measurement. R. E. Reason. *J. Inst. Prod. Eng.,* v. 23, no. 10, Oct. '44, Edit. B, pp. 347-372. British Non-Ferrous Metals Research Association *Bulletin,* v. 25, April '45, p. 95.

Importance of physical and geometrical aspects with emphasis on the latter; basic stylus instrument; unit of measurement; graphs of surfaces; use of special instruments (auto-collimator, waviness instrument, roughness instrument with skid, Tomlinson instrument, profilometer, Talysurf) in connection with measurement of different kinds of surface imperfection.

12-78. Symposium on Surface Finish. *Engineering,* v. 159, March 23, '45, pp. 237-239.

Drawing office specification; rational specification of surface finish; requirements in surface finish; surface finish on production methods; results of modern practice.

12-79. Diesel - Engine Bearings. L. M. Tichvinsky. *Mechanical Engineering,* v. 67, May '45, pp. 297-308.

Discussion of failures and progressive inspection methods.

12-80. Magnetic Crack Detection, II. J. E. D. Bell. *Aircraft Engineering,* v. 17, March '45, pp. 88-90.

Describes the common defects which can be revealed by this system, and the machines and jigs used in their detection.

12-81. Simple Diagrams Solve Problem of Thread Gage Instruction. Montgomery Schuyler. *American Machinist,* v. 89, May 10, '45, p. 103.

Visual program gave inspectors a clearer mental picture of the relationship and operation of gages used in checking parts.

12-82. Internal Inspection Device. *Production Engineering & Management,* v. 15, May '45, p. 99.

Visual inspection of hole edges within small bores is performed on a production basis with microscope, two mirrors, and a light beam.

12-83. The Use of Static Tests as a Method of Determining the Radiographic Classification of Castings. Frank S. Wyle. *Industrial Radiography,* v. 3, Spring '45, pp. 13-20.

Defines some of the terms used by engineers in designing castings. Shows where the existing specifications require static testing and the sequence of stages between the original design and the final determination of classification. Examples of static tests which have been conducted and pitfalls which must be guarded against in making static tests. Other types of tests which are extremely valuable in setting radiographic standards.

12-84. Foundry X-Ray Service. Ned M. Field. *Industrial Radiography,* v. 3, Spring '45, pp. 23-25, 28.

What the foundryman expects from the X-ray laboratory.

12-85. Safety Code for the Industrial Use of X-Rays. *Industrial Radiography,* v. 3, Spring, '45, pp. 29-34.

Proposed code.

12-86. Qualifications of an Industrial Radiographer. Eugene Morze. *Industrial Radiography,* v. 3, Spring '45, pp. 34-35.

Type of examination, scope and method of application.

12-87. X-Rays in the Light Alloy Foundry. F. R. Mansfield. *Industrial Radiography,* v. 3, Spring, '45, pp. 36-43.

Practical application of routine radiography for development of sound casting methods and production control. Requisite plant and techniques detailed.

12-88. Magneto-Inductive Testing. W. Schirp. *Metal Industry,* v. 66, April 6, '45, pp. 216-217.

A magneto-inductive method of testing non-ferrous tubes and rods for defects, for correctness of heat treatment, for composition, for diameter and for wall thickness is described in this R.T.P. translation of an article from *E.T.Z.,* v. 64, 1943, p. 413.

12-89. Steel Castings Radiography. E. L. LaGrelius and C. W. Stephens. *American Foundryman,* v. 7, May '45, pp. 49-56.

Reviews briefly the underlying principles necessary for the production of good radiographs, proposes a concise radiographic terminology, and lists the probable causes for casting defects revealed by radiography.

12-90. SAE War Engineering Board Report. Shop Procedure for Repairing Apparent Imperfections in New Automotive Gray Iron Castings. *American Foundryman,* v. 7, May '45, pp. 68-71.

Representative of the American Foundrymen's Association and the American Welding Society appointed to review and recommend changes in OCO-D Engineering Bulletin No. 152, and to prepare a recommended shop procedure for repairing apparent imperfection in new automotive gray iron castings.

12-91. Bolt Stress Measurement by Electrical Strain Gages. G. A. Maney. *Fasteners,* v. 2, no. 1, pp. 10-13.

Results of an exploratory nature of research indicate the action of force and torque in wrenched-up bolts; describes a new technique for their measurement.

(Continued on page 10)

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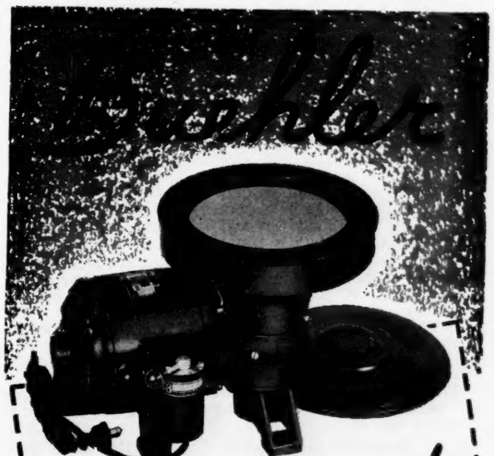

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A.S.M. Review of Current Metal Literature — *Continued*

12. INSPECTION AND STANDARDIZATION (*cont.*)

12-92. **Black Light Inspection of Aluminum Castings.** E. V. Blackmun and Edwin Bremer. *Foundry*, v. 73, May '45, pp. 96-99.

Fluorescent penetrant or black light method involves immersing the parts to be inspected in the penetrant for several minutes, removing the excess by draining, and washing, and then dusting the part with a light coat of talc. Latter withdraws and absorbs the fluorescent oil from the surface discontinuities and provides optimum conditions for examination of the part under near-ultraviolet or black light.

12-93. **Specifications for Steel Castings Now Being Revised.** *Steel*, v. 116, May 14, '45, p. 116.

Specifications for high strength steel castings for structural purposes and mild to medium strength carbon steel castings for general application.

12-94. **X-Ray Intensifying Screens.** John Delisa. *Steel*, v. 116, April 30, '45, pp. 110, 113.

Method for mounting lead foils.

12-95. **Relation of Surface-Roughness Readings to Actual Surface Profile.** L. P. Tarasov. American Society of Mechanical Engineers *Transactions*, v. 67, April '45, pp. 189-196.

Studies of surface finish have shown the desirability of relating profilometer roughness readings to actual peak-to-valley distances of the type that a micrometer measures. Approximate multiplying factors for converting profilometer readings into peak-to-valley roughness have been obtained from taper sections of a variety of abrasive-finished steel surfaces with profilometer roughness in the range of 1 to 100 microinches rms. For cylindrical ground surfaces, the factor can be taken as about 4½; for other types of fixed-abrasive finishes, as 6 or 7; and for loose-abrasive lapped surfaces, as 10. These are mean values, and individual factors may deviate by as much as one-third of the mean value. The factors quoted give values for "predominant peak" roughness; they should be doubled to obtain "deepest maximum" roughness, this being a second way of describing the peak-to-valley roughness.

12-96. **Testing and Inspection.** *Metals & Alloys*, v. 21, April '45, pp. 1112, 1114, 1116.

Testing methods and equipment for physical and mechanical properties, surface behavior and special characteristics. Radiographic, spectrographic, identification, metallographic, dimensional and surface inspection. Stress analysis and balancing. Specifications, standards and quality control.

12-97. **Inspection Tests for the Adhesion of Electroplated Coatings With Particular Reference to the B.N.F. Adhesion Test.** A. W. Hothersall and C. J. Leadbeater. *Metal Finishing*, v. 43, May '45, pp. 191-194.

Three types of tests investigated; each type embodied the same principle for indicating weak adhesion, viz., the deposit was made to expand, generally or locally according to the test employed, resulting in flaking or blistering at non-adherent areas. In general, the three methods differed only in the means of producing the expansion of the coatings.

12-98. **Salvaging and Process Control With the Cyclograph.** J. Albin. *Iron Age*, v. 155, May 17, '45, pp. 62-64.

Use of cathode ray device for non-destructive inspection of materials by use of automatic feeding machines to pass pieces into the Cyclograph coupled with mechanisms which separate the acceptable pieces from the rejects. Small malleable castings have been included in this form of automatic inspection.

13. TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-10. **Overshooting Prevented in Temperature Control.** M. J. Manjoine. *Iron Age*, v. 155, May 3, '45, p. 61.

Servo-type thermocouple device which increases the sensitivity and response of conventional temperature control. Consists of two thermocouples of different thermal capacity and an electric heating element, enclosed in an evacuated glass envelope.

13-11. **Nickel and Inconel Thermocouple Protection Tubes.** E. M. Kline and A. M. Hall. *Metals & Alloys*, v. 21, Feb. '45, pp. 401-403.

Report of the successful and advantageous use of nickel and inconel thermocouple protection tubes for lead pot, salt bath, and controlled atmosphere service.

14. FOUNDRY PRACTICE AND APPLIANCES

14-134. **Prospects for Principal Cast Metals.** Donald J. Reese. *Tool & Die Journal*, v. 11, April '45, pp. 102-104.

Why the foundry process of manufacture is of value to the engineer in his efforts to build better machines.

14-135. **Metallurgy of Die Casting.** J. L. Erickson. *Metal Industry*, v. 66, April 6, '45, pp. 217-218, 220.

Die casting is more of an art than a science, and will remain so until the fundamental metallurgy of the process receives more consideration. (From *The Foundry*.)

14-136. **Casting Short-Run Variable Designs.** J. N. McLaughlin. *Iron Age*, v. 155, April 19, '45, pp. 67-70.

Method devised with the object of obtaining the advantages related to match-plate production without incurring the full costs which would normally accrue from standard match-plate use.

14-137. **Distinctive Features of Sterling Permanent Molds for Aluminum Piston Castings.** Joseph Geschelin. *Automotive Industries*, v. 92, April 15, '45, pp. 30-32, 68, 70.

Patented permanent mold equipment is said to produce pistons of unusual quality, featuring density of structure, freedom from porosity, fidelity of dimensional tolerances, and exceptionally fine finish of the cavity.

14-138. **Die Casting Grey Iron in a British Foundry.** *Machinery* (London), v. 66, March 29, '45, pp. 333-339.

The siphon-brick method; continuous rotary-die casting machine; sand cast dies.

14-139. **Metallurgical Aspects of Machine-Tool Castings.** J. G. Ritchie. *Foundry Trade Journal*, v. 75, March 22, '45, pp. 231-234.

Meeting the requirements of the engineer. Effect of section, total carbon and silicon; melting practice; damping capacity.

14-140. **Steel Foundry Practice.** *Metallurgia*, v. 31, March '45, pp. 253-256.

Report divided into six parts which include the feeding of simple castings; the "whirl-gate" head and the "atmospheric" head feeding compounds; hot tears; wartime activities; and fundamental casting problems to be considered. (Iron & Steel Institute, Feb. '45.)

14-141. **Centrifugal Casting of Steel.** C. K. Donoho. *Western Metals*, v. 3, April '45, pp. 10-14.

Elongation; types of centrifugal casting; molds; axes; spinning speeds; typical castings; structure and properties; quality considerations. 8 ref.

14-142. **Permanent Mold Castings.** Alfred Sugar. *Metals & Alloys*, v. 21, April '45, pp. 1015-1028.

Points out the design possibilities and limitations of permanent mold castings as well as the many pitfalls in the path of a permanent mold foundryman. Care and practice have shown that all the variables in the art will lend themselves to ready control in production. 10 ref.

14-143. **Runners and Risers.** A. Roberts. *Institute of Australian Foundrymen: Australasian Engineer Science Sheet*, Dec. 7, '44, pp. 2-5. Iron & Steel Institute *Bulletin* no. 111, March '45, p. 123-A.

Recommendations are made on the dimensions of sprues, runners, gates, and risers and on their best positions relative to the casting.

14-144. **Molding Sands of South Australia.** H. A. Stephens. *Australian Institute of Metals: Australasian Engineer Science Sheet*, Nov. 7, '44, pp. 22-29. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 123-A.

Various features of South Australian molding sands and molding practice are discussed. South Australian molding sands are found to be poor, but molding practice can be improved by the wider use of synthetic sands and by increased attention to the preparation of the sand.

14-145. **The Influence of Various Metallurgical Factors on Ingot-Mold Life.** B. Koros. Iron and Steel Institute Translation Series, no. 211, 1945. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 125-A.

An English translation of a paper which appeared in *Stahl und Eisen*, v. 64, March 9, '44, pp. 159-164. (See Iron and Steel Institute *Journal*, 1944, no. II, p. 148-A.)

14-146. **The Effect of Grain Shape on the Molding Properties of Synthetic Molding Sands.** W. Davies and W. J. Rees. *Refractories Journal*, v. 21, March '45, pp. 98-118.

14-147. **Effect of Gas on the Properties of Magnesium Sand Casting Alloys.** R. S. Busk and R. F. Marande. *American Foundryman*, v. 7, May '45, pp. 34-44.

Investigation has shown that gas will produce an appearance substantially the same as microshrinkage. Severity of microporosity is proportional to exposure to moisture. Methods of removing the effects of gases, and particularly hydrogen, in metals by lowering the partial pressure and introducing an agent that reacts with the hydrogen in such a way as to remove it. 7 ref.

14-148. **Effect of Composition on Mechanical Properties of Sand Cast Copper-Tin-Lead-Zinc Alloys.** W. T. Battis. *American Foundryman*, v. 7, May '45, pp. 45-48.

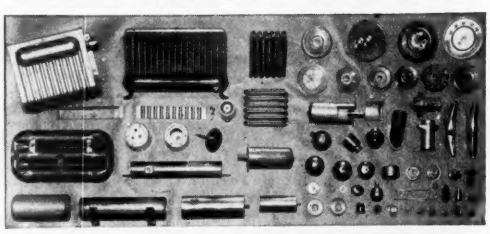
Mechanical property determinations on a series of sand-cast copper-base alloys; calculated effects of composition changes, presented graphically and in tabular form. 3 ref.

14-149. **The Postwar Outlook for the Foundry Industry.** E. F. Platt. *American Foundryman*, v. 7, May '45, pp. 66-67.

Emphasizes the need for intelligent cooperation within the industry to meet the problems of postwar competition.

14-150. **Founding of Magnesium Alloys.** *Light Metals*, v. 8, April '45, pp. 171-172.

Principles of ultra-light alloy casting summarized, and the need for assessing each individual case on its own merits stressed.



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14-151. **Pressure Die Casting.** J. L. Erickson. *Light Metals*, v. 8, April '45, pp. 173-189.

Effect exerted by air trapped in the die cavity on the physical properties of certain die-casting alloys and on their heat treatability. Design of a special die constructed to investigate the effects.

14-152. **Advantages of Ingot Metal.** George F. Beard. *Canadian Metals & Metallurgical Industries*, v. 8, April '45, pp. 28-32.

Modern refining facilities and laboratory control aid foundry industry. Ingot vs. scrap; impurities in copper alloys; aluminum and its alloys; metallic impurities in aluminum; laboratory control.

14-153. **Gating, Risering, and Chilling of Magnesium Sand Castings.** A. Cristello. *Foundry*, v. 73, May '45, pp. 94-95, 254.

Information, sketches and outlines delivered at a War Production Board meeting of Magnesium Sand Casting Section, Cleveland, Nov. 29-30, 1943.

14-154. **Centrifugal Casting Speeds.** J. E. Hurst. *Foundry*, v. 73, May '45, pp. 100, 128, 220, 222, 224, 226.

Centrifugal casting speeds employed in commercial practice. 22 ref.

14-155. **Plant Modernization Increases Malleable Production.** William G. Gude. *Foundry*, v. 73, May '45, pp. 102-105, 230, 232.

Belle City Malleable Iron Co., Racine, Wisconsin, revamped a large part of its foundry to incorporate duplex melting facilities, mold conveyors and mechanical sand handling equipment.

14-156. **High Reproducibility in Precision Casting.** W. A. Morey. *Iron Age*, v. 155, May 10, '45, pp. 75-77.

Many steps in the process lend themselves to rigorous scientific control. Future possibilities appraised. (Before the foundry panel, Chicago War Production Conference, March 29.)

14-157. **Die Casting Precision Parts.** S. U. Siena. *Steel*, v. 116, May 14, '45, pp. 108-111, 146, 148, 152, 154.

Millions of parts for instruments by slow-squeeze method of cold chamber injection. Tolerances on some parts held within 0.001 in and comparatively little machining is required.

14-158. **The Centrifugal Casting of Aluminum Alloy Wheels in Sand Molds.** L. Northcott and O. R. J. Lee. Institute of Metals *Journal*, v. 71, March '45, pp. 93-130.

Wheels centrifugally cast in sand molds rotated on a vertical axis, using four aluminum-rich alloys: DTD 304, 2L33, DTD 300, and RR 50. In centrifugal casting of spoked wheels, porosity tends to be concentrated at the junctions of the arms with the rim and cannot be eliminated by increasing the speed of rotation unless the cross-sections of the arms are larger than in normal practice for static castings. Mechanical properties of samples from three positions in each casting were determined. Although there was only a slight increase in density, test bars from centrifugal castings in DTD 304 showed an improvement of 15% in tensile strength and 78% in elongation over a static casting. Macrostructure of the centrifugal castings showed columnar crystals growing from inner vertical surfaces, with equi-axial crystals in the outer zones of the castings. As the speed of rotation increased, the columnar crystals became longer and the equi-axial crystals smaller. Additional castings in other selected alloys provided data which confirmed an explanation of the origin of the structures based on the operation of a centrifuging action during the solidification interval, when the densities of liquid and solid are different. 26 ref.

14-159. **Making Die Castings.** H. E. Nagle. *Steel*, v. 116, April 23, '45, pp. 92-96, 138.

Details of intricate die design and production methods in Yale & Towne's Stamford plant.

14-160. **First Report of the Foundry Practice Sub-Committee of The Steel Castings Research Committee.** Iron & Steel Institute, Advance copy, Feb. '45, 53 pp.

Part 1, work on the running and risering of simple shapes. Developing the so-called "whirl-gate" head method of feeding steel castings and recent examples of the application of this type of head and of the "atmospheric" head described and illustrated in Part 2. Foundry trials comparing the different types of feeding compound used on the fluid steel as it rises into the heads of steel castings summarized in Part 3. Part 4, experiments designed to provide a numerical index of the tendency of different steels to hot tears in the mold. In part 5 some of the wartime activities of the sub-committee are set out, and some fundamental casting problems are mentioned in Part 6.

14-161. **Core Making.** *Steel*, v. 116, April 30, '45, p. 116.

Speeded up by conveyor ovens which cut much handling work, produce cores with greater impact and tensile strength, make 32% saving over previous methods, handle 7500 lb. of cores.

14-162. **Melting and Casting.** *Metals & Alloys*, v. 21, April '45, pp. 1072, 1074, 1076, 1078.

Melting, alloying, refining and casting methods, furnaces and machines. Iron and steel making, non-ferrous metal production, foundry practice and equipment. Die casting, permanent mold casting, precision casting, etc. Refractories, control equipment and accessories for melting furnaces.

15. SALVAGE AND SECONDARY METALS

15-12. **Chemical Control.** F. F. Pollak and F. Pellowe. *Metal Industry*, v. 66, April 6, '45, pp. 210-212.

During the war there has been a considerable lack of virgin metal and a superabundance of swarf. It has been found possible by careful control to cast bars from all-swarf mixtures of such quality that they could be used in place of extruded rods. 18 ref.

15-13. **Secondary Aluminum Ingot Smelters Favor Disposal of Government Surplus by Negotiation.** J. B. Neiman. *Metals*, v. 15, April '45, pp. 9-12.

Prefer that sales method over others; industry against government conversion of scrap aluminum stockpile into ingots.

15-14. **Salvaging Aluminum Castings.** *Modern Metals*, v. 1, May '45, pp. 13-15.

Value of salvaging light metal castings has been proven during this war. On return to peacetime production, this knowledge will result in substantial savings both to the producer and manufacturer.

15-15. **Britain Guards Against Waste.** W. J. Hargest. *American Machinist*, v. 89, May 10, '45, pp. 126-129.

Typical of large aircraft engine plants Rolls-Royce has installed centralized oil and chip salvage facilities. Chip handling is conveyorized and oil reclamation is operated from a single panel.

15-16 **Recovery of Copper From Waste Waters.** B. A. Southgate and J. Grindley. *Industrial Chemist*, v. 21, March '45, pp. 144-152.

Metal industry problem; diverse conditions; loss of copper; spent pickle liquor; waste washing water; laboratory experiments; observations; sludge removal; horizontal flow tanks; experiments with full-scale plant; iron in e[illegible]ent; value of recovered copper.

15-17. **Secondary Aluminum Alloys.** *Metal Industry*, v. 66, March 30, '45, p. 201.

Secondary aluminum alloys containing 4 to 12% Cu with a high amount of impurities: 0.8 to 3.3% Fe, 0.25 to 1.5% Si, 0.3 to 1.5% Zn, and 1 to 10% Pb, Mn Mg, to determine the effect of small amounts of cerium showed improved mechanical properties and finer grain with cerium additions.

16. FURNACES AND FUELS

16-44. **Non-Ferrous Metal Melting, II.** Davidlee Von Ludwig. *Industrial Gas*, v. 23, April '45, pp. 11-14, 32.

Comparison of test bar castings made in oil and gas-fired crucible furnaces.

16-45. **Application of Burner Equipment to Furnaces.** A. H. Koch. *Industrial Gas*, v. 23, April '45, pp. 15-16, 31.

Availability of fuel and equipment will take second place to production costs during and after the reconversion period. Careful study of heat treating production costs undoubtedly will bring about the conversion of many existing furnaces to gas fuel.

16-46. **Induction Burners for Blast Furnace Gas, Producer Gas and Coke Oven Gas.** G. Neumann. *Archiv fur das Eisenhuttenwesen*, v. 17, May-June '44, pp. 237-246. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 120-A.

Induction gas burners have previously been described by W. Heiligenstaedt (see Iron and Steel Institute *Journal*, 1943, no. II, p. 35-A). In the present mathematical treatise curves and equations are developed showing the relationship between gas and air pressure at the burner and the furnace pressure, and examples are given of their applications to determine the dimensions of burners to meet certain rquirements when the fuel consists of blast furnace gas, producer gas or coke oven gas mixed with cold air.

16-47. **Gas Turbines for Blast Furnace Blowers.** Paul R. Sidler. *Iron & Steel Engineer*, v. 22, April '45, pp. 35-45.

Gas turbines offer certain advantages without sacrificing reliability; blast furnace operators might well consider these advantages in planning replacement or extension of blowing equipment. 4 ref.

16-48. **Industrial Furnaces.** R. J. Sarjant. *Iron & Steel*, v. 18, April '45, pp. 128-132.

Discusses, with relation to furnaces, the questions of the availability and economics of fuels, improvements in furnace design, smoke destruction, and the importance of the further education of industry to the necessity for still greater efficiency in the use of fuel, with its concomitant reduction in atmospheric pollution.

16-49. **An Analysis of Open-Hearth Combustion.** Gilbert E. Seil. *Steel*, v. 116, May 14, '45, pp. 124, 172, 176, 178, 180.

Multiple burners firing crosswise over open-hearth bath affords increased rate of heat transfer and more tons of steel per hour. Preheated air is supplied either by checker chambers of reversible furnace or by recuperator of one-way furnace.

16-50. **Reversing Regenerative Furnaces.** J. R. Green and J. P. Vollrath. *Iron & Steel Engineer*, v. 22, April '45, pp. 67-77, 81.

The use of reversal control, either signaling or fully automatic, on regenerative furnaces will result in more uniform operation, increased output and decreased refractory maintenance.

17. REFRACTORIES AND FURNACE MATERIALS

17-21. **Permeable Refractories for Furnaces.** D. C. Gunn. *The Gas Times*, v. 40, no. 517, Sept. 2, '44, p. 24. *Engineers' Digest* (American Edition), v. 2, April '45, p. 184.

Hot face or fireclay insulating material which is burnt with carbonaceous material included in it. On firing, the carbonaceous material burns out, and leaves a porous structure, resulting in a brick possessing exceptional properties. These properties are low thermal conductivity and low thermal capacity.

17-22. **The Durability of Refractories.** W. J. Rees. Birmingham Metallurgical Society *Journal*, v. 24, June '44, pp. 102-117. Iron and Steel Institute *Bulletin*, no. 111, March '45, p. 118-A.

Factors affecting the life of refractory bricks and cements discussed. Firebricks which contain any free iron oxide disintegrate rapidly if used in a furnace where carbon monoxide is present. If the brick is burnt under reducing conditions at the peak temperature of the kiln the oxide combines with the clay to form a complex silicate which is unaffected by carbon monoxide. Furnace walls have failed recently when the fuel has been changed from ordinary fuel oil to crude pitch oil; this may be due to ash which is rather high in iron oxide settling on the wall or to faulty burner control causing the oil to be carried forward so as to burn on the face of the brick.

17-23. **Classification of Natural Organic Binders.** Edward P. McNamara and Jay E. Comeforo. *Refractories Journal*, v. 21, March '45, pp. 120-123.

Modulus of rupture, loss on tumbling, migration, water absorption, and burn-out characteristics were studied using a series of organic compounds representative of the types used as binders for ceramic materials. The results are interpreted in terms of the constitution of the organic compounds in terms of the mechanism of specific adhesion. The binding strength of an organic material may be predicted from a knowledge of its molecular constitution.

(Continued on page 12)

Employment Service Bureau

Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.
Applicants for the positions listed below are required to observe the rules and regulations of the War Manpower Commission regarding a Statement of Availability, if employed in an essential activity.

POSITIONS OPEN

METALLURGIST: Young, with knowledge of alloy, stainless and carbon steel applications. Required by eastern warehouse distributor. Will involve some contact work. Write stating education, experience, age, draft status, ability and salary expected. Replies strictly confidential. Box 6-5.

ASSISTANT SALES METALLURGIST: With a degree in metallury. Some experience desirable, preferably non-ferrous. Personality suitable for contacting customers after training. Strong postwar. Our own staff knows of this ad. Write full details to Box 6-10.

SALESMAN; ALLOY AND STAINLESS STEEL: Old established steel concern, Chicago area, has opening for graduate metallurgist with mill or industrial plant experience or equivalent. Excellent opportunity for young man now working in plant but interested in sales. Previous sales experience not necessary. State age, education, experience, salary expected. Box 6-15.

TECHNICAL SALESMAN: Young man with some engineering knowledge along testing machine lines to undergo training period for technical sales position. Excellent opportunity for young man with ambition and enthusiasm. Please state full details of background. Box 6-20.

ELECTRODE DESIGNER: Manufacturer of coated electrodes needs engineer experienced in formulation and production of ferrous electrodes to design new lines. Good postwar opportunity. Write details of education, experience and qualifications. Box 6-25.

ELECTRODE DESIGNER: Electrode manufacturer requires young man with engineering background, quick, adaptable, as assistant to experienced formulator. Some experience in production or formulation desirable. Postwar opportunity. Write details of background, experience, salary. Box 6-30.

METALLURGIST: Experienced in steel making, casting, heat treating techniques; to organize expanded program of fundamental research primarily on ferrous metals. Some mechanical testing and metallography. Excellent position now and postwar. Give details of background, experience, and salary required. Box 6-35.

ASSISTANT METALLURGIST: With college training and some practical plant experience. Wanted by west coast manufacturer of oil drilling tools. Excellent postwar future. State full information including salary expectations. Box 6-40.

METALLURGIST: Experience in high speed steel; midwest location. Box 6-45.

TECHNICAL SALES-SERVICE MEN: For metal cleaner. Several excellent territories open in rapidly expanding metal cleaner department. Apply by letter giving details of experience. Box 6-50.

METALLURGISTS AND METALLURGICAL ENGINEERS: War industry with exceptional postwar opportunities looking for experienced metallographer. Also research metallurgists for development of non-ferrous metals, special assignments on aluminum, magnesium, and powdered metals. Also metallurgical engineer for development work on steel forgings and tool steels. Write Supervisor, Technical Employment, Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh, Pa.

METALLURGICAL ENGINEER: Required by eastern distributor of alloy steels for promotional and development work. Must have knowledge of stainless steel mill practice and stainless steel applications. Write stating education, experience, age, draft status, availability and salary expected. Replies strictly confidential. Box 5-5.

MECHANIC OR TOOL ENGINEER: Thoroughly familiar with tool setups and machining stainless, alloy, carbon steels. Required for customer contact work by steel distributor covering eastern states. Write stating age, education, experience, draft status, availability and salary expected. Replies strictly confidential. Box 5-90.

METALLURGISTS: At least one year's experience in ferrous or non-ferrous metallography. Experience in failure analysis of engine parts would be particularly helpful. Good postwar prospects in present essential industry located in middle west. Box 5-95.

CARBIDE TECHNICIAN: Well-known eastern company with established sales outlet has excellent opportunity for chief technician to develop carbide line, especially for wear resistant applications. Fundamental processing equipment installed. Company also interested in cast tool development, precision and centrifugal castings, with particular reference to special heat resisting applications, such as gas turbines. State age, education, experience, salary desired and draft status. Box 5-100.

RESEARCH METALLURGIST: Preferably one who has had several years' experience either in graduate work or in the steel industry, to work in research laboratory of large manufacturer of alloy and tool steels in the East. Good opportunity for permanent position. Statement of availability required. Box 6-80.

METALLURGIST: To head department on ferrous research and control. Knowledge of metallography and heat treatment essential; M.Sc. preferred. Permanent postwar position near Pittsburgh. Salary $4000 to $4800. Box 6-85.

PRODUCTION RESEARCH METALLURGIST: For work on aluminum and magnesium alloys. College graduate; minimum of five years' experience in smelting or foundry work. Box 6-90.

POSITIONS WANTED

HEAT TREAT FOREMAN: 28 years old; 7½ years' experience as supervisor and foreman. Knowledge of heat treat production on screw machine products and aircraft engine parts; also hydrogen brazing furnaces and hydraulic pusher furnace. References furnished. Box 6-55.

WELDING ENGINEER: Technical education and 16 years' experience in laboratory development and field application of arc (manual and automatic) and gas welding procedures. Familiar with ferrous, copper and aluminum alloys. Capable of managing field engineering and service work for manufacturer of welding equipment, rods and electrodes. Box 6-60.

CHIEF METALLURGIST for western railroad desires position with a smaller progressive concern with a postwar future. Experienced in heat treating of tools, large and small, alloyed and plain carbon steels, photomicroscopy, failure investigations, welding research and production problems, specification and report writing, physical testing, shop and foreign inspection and some foundry work. B.S. in Chem. Engr., age 30, draft status 2B. Box 6-65.

METALLURGIST AND CHEMICAL ENGINEER: Wants to return to California. Experience in aluminum and steel fabricating, processing, and heat treatment. With Los Angeles aircraft plant two years before coming East. Has handled both production and research. Age 38. Box 6-70.

MANAGER-METALLURGIST: Excellent technical background and wide industrial heat treating experience. Available for position with postwar stability. Well qualified to plan, install, operate, and manage plant doing all varieties of general and special heat treating. Familiar with latest heat treating methods and equipment. Can produce results. Box 5-70.

METALLURGIST: Wide experience as consultant in process and quality control. Thoroughly familiar with steels, heat treating equipment, and heat treating methods. Excellent education. Exceptionally well qualified to carry on practical research program or give technical assistance to sales force of a company handling heat treating equipment, steel, forgings, castings, or related materials. Box 5-75.

GRADUATE METALLURGICAL ENGINEER: Age 36; married. 12 years' experience in all phases of fabrication and heat treatment of ferrous metals; particularly alloy steels. Production control, development work, and customer contacts. Desires responsible, permanent postwar assurance. Salary $7,500; location immaterial. Box 5-140.

FERROUS METALLURGIST: Desires position as sales engineer or quality control metallurgist. B.S. and M.A.; four years' experience; last 16 months as contact metallurgist. Box 6-75.

METALLURGICAL ENGINEER: Young, ambitious, ten years' experience in research laboratory. Knows metallography, heat treatment and fabrication techniques; has done special research on melting and alloying problems. Desires permanent position with chance to do research commensurate with ability. Prefers small, aggressive organization, contemplating postwar expansion. Classified 2-B; release obtainable. Box 6-95.

INSPECTOR: Good technical background and wide experience in industrial inspection in the petroleum refinery field. Has been assistant to metallurgist and done laboratory work in testing and research. Also educated in Holland; naturalized American citizen. Location immaterial. Box 6-100.

PHYSICAL METALLURGIST: Electrochemist. Control heat treating department, plain and alloy steels, aluminum alloys; metallurgical, metallographic and chemical laboratory; metal finishes; some experience in brass and zinc coated wire, dies, precision centrifugal steel castings, austempering; knowledge of selenium rectifier production. Reads several European languages, executive experience, above draft age. Box 5-60.

Film and Program on Magnesium Available to Engineering Groups

A sound film depicting the production and fabrication of magnesium has been made available to engineering groups without cost by the Hills-McCanna Co., 3025 N. Western Ave., Chicago.

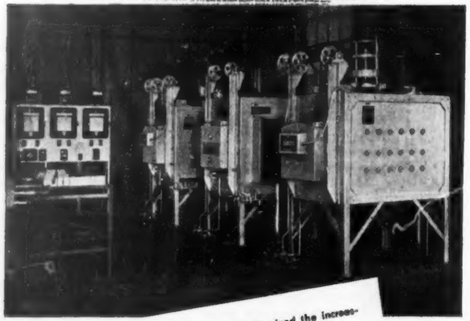
Particular emphasis is placed on foundry operations, and a display of varied types of magnesium products, produced from sheet, rod, tube, extrusions, forgings, sand, die and permanent mold castings, is included. Talks are made by company officials, and as souvenirs the company distributes magnesium disks and a booklet entitled "A Tour of a Modern Magnesium Foundry".

Almen Discusses Stresses at Dayton

Reported by T. E. Hamilton
Metallurgist, Delco Products Division, G. M. C.

J. O. Almen of the Research Laboratories Division of General Motors Corp. discussed "The Effect of Residual Stresses on the Fatigue Strength of Structural Materials" before the Dayton Chapter on March 7. Mr. Almen stress analyzed a variety of parts to show how stresses imposed by peening, carburizing, nitriding, etc., greatly increase their fatigue strength. He also showed how many parts failed during test or in actual use because of improper stress patterns.

For Peak Maintenance Programs



● Man power shortages have emphasized the increasing need for modern efficient equipment in railway maintenance shops. Heat Treating furnaces are important factors in speeding production of repair parts and should have primary consideration in any modernizing program. Illustrated is a new Railroad installation of Hevi Duty Furnaces at Aurora, Illinois, used for hardening of carbon locomotive shop tools and heat treating of carbon and high speed tool steels. There is a Hevi Duty type and size to fit your particular needs — send for bulletins.

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Metal Literature Review—*Continued*

17. REFRACTORIES (*Cont.*)

17-24. **Basic Bricks—I.** *Iron & Steel*, v. 18, April '45, pp. 110-115, 119.

Methods whereby the effects of the almost total loss of magnesite imports have been overcome and a new industry created.

17-25. **Refractory Concrete for Furnace Construction.** Gerald T. Haddock. *Metals & Alloys*, v. 21, Feb. '45, pp. 395-400.

Review of the characteristics, uses and methods of applying refractory concrete—a group of special refractory materials that can be poured in place to give intricate, joint-free, high temperature (or insulating) furnace structures of a wide variety of types.

17-26. **Controlling Furnace Erosion.** Edwin N. Hower. *Steel*, v. 116, April 30, '45, pp. 118-121.

Drop sections of silica brick along open-hearth skew-back help to prolong roof life. Basic brick found advantageous in making front and backwall repairs. Masonry crews trained in the art of hot patching roofs have been found highly beneficial in many open-hearth shops.

17-27. **Heat Losses and the Insulation of Open-Hearth Furnaces and Blast Furnaces.** J. M. Ferguson. Institute of Fuel *Journal, (Wartime Bulletin)*, April '45, pp. 142-150, 166.

Large numbers of heat units lost in process, and considers the possibilities of reducing these losses by an increased use of the insulating materials which are serviceable at the temperatures met with in iron and steel manufacture.

18. HEAT TREATMENT

18-92. **Influence of Tempering Temperatures Upon the Strength of Heat Treated Steels.** D. W. Rudorff. *Metallurgia*, v. 31, March '45, pp. 237-240.

By the proper heat treatment of steels it is possible to obtain a combination of properties; thus, tempering a hardened steel will increase its toughness at the expense of the hardness property, but the tempering temperature is known to have considerable influence on the strength of steels. This review of an investigation on the subject deals with results of tests on two carbon steels and two low-alloy steels.

18-93. **Metallurgical Control of Shaved Aircraft Gears.** R. E. Liebendorfer. *Iron Age*, v. 155, April 19, '45, pp. 56-61.

Discusses the heat treatment of the gears, with particular emphasis on carburizing practice. Since the gear teeth are not touched after hardening, it is essential that decarburization be avoided during hardening. Radically new methods have been devised to measure and control the amount of decarburization that might take place in thin surface layers.

18-94. **Spheroidizing Cycles Standardized.** H. L. Hopkins. *Iron Age*, v. 155, April 19, '45, pp. 72-75.

By correlating a series of tests, the proper annealing temperatures for six types of steels have been determined within very narrow temperature ranges. This has resulted in man-hour and fuel savings and a consistently higher quality product.

18-95. **Fundamental Principles and Applications of Induction Heating.** *Sheet Metal Industries*, v. 21, April '45, pp. 651-657, 681.

Internal hardening and assembly processes. 10 ref.

18-96. **Heat Treatment of Steel.** *Canadian Metals & Metallurgical Industries*, v. 8, April '45, pp. 20-27.

Metallurgical principles involved in efficient operations: Austenitizing; transformation of austenite; normalizing; full annealing; isothermal annealing and spheroidizing; hardening; retained austenite; internal stresses. 53 ref.

18-97. **Sub-Zero Treatment of Steels.** H. C. Amtsberg. *Canadian Metals & Metallurgical Industries*, v. 8, April '45, pp. 33-36.

Presentation of the fundamentals of cooling hardened steels to temperatures considerably below room temperature, properly correlated with the basis treatment cycle and related structural changes. 11 ref.

18-98. **Heat Treating 18-8 Stainless in Salt Baths.** Keith Whitcomb. *Iron Age*, v. 155, April 26, '45, pp. 48-52.

Investigation for a suitable molten salt bath to be operated at a high temperature for the annealing of welded 18-8 stainless steel and the removal of welding flux, has resulted in the selection of pure sodium carbonate which has great stability, ease of operation and from an economic standpoint is eminently satisfactory over a variety of the barium chloride types.

18-99. **Age-Hardenable Beryllium-Copper.** *Wire Industry*, v. 12, April '45, pp. 195-197.

Recommended treatment in wire form. Heat treatment; oxidation dangers; close pyrometric control essential.

18-100. **Experiments Reveal Versatility of High Frequency Heating.** E. D. Tillson. *Industry & Power*, v. 48, May '45, pp. 64-66.

Tests conducted with over 200 different materials indicate that induction and dielectric heating are worthy of industry's closest attention and study.

18-101. **Continuous Heat Treatment of Shells.** D. E. Wyman. *Metals & Alloys*, v. 21, April '45, pp. 1009-1012.

Interesting practice and modern equipment used by one manufacturer for shell hardening and tempering.

18-102. **Heat Treating High Speed Steels.** H. E. Lewis. *Steel Processing*, v. 31, April '45, pp. 222-228.

Flame curtain; flame curtain adjustment; loading; quenching; atmosphere requirements to prevent decarburization; testing.

18-103. **Heat Treating Aluminum Alloys.** Carl L. Goodwin. *Light Metal Age*, v. 3, April '45, pp. 16-19, 32, 36-37.

Discusses the changes that take place in the physical structure of aluminum alloys under different forms of heat treatment, the reasons for different heat treatments, and types of equipment for best results.

18-104. **Controlled Spheroidization of Pearlitic Malleable Iron.** C. R. Wiggins. *Iron Age*, v. 155, May 10, '45, pp. 78-81.

To correct some misimpressions of the mechanism of short cycle malleabilization, the practice in the production of Z-Metal reviewed. Spheroidization chart presented that could serve as a standard of spheroid particle size for other ferrous materials, such as steels.

18-105. **Spheroidizing.** J. G. Ritchie. *Australian Institute of Metals: Australasian Engineer*, v. 44, Nov. 7, '44, pp. 25-35. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 127-A.

A short explanation of the term spheroidizing is given and the means by which a spheroidized structure can be obtained are pointed out. These include: (1) Subcritical annealing, which is largely a slow diffusion process, carried out to increase the ductility of medium carbon steels. The time required is extremely long, but can be shortened by a hardening pretreatment. Spheroidization is also accelerated by previous cold work. (2) Spheroidizing by transformation of austenite to spheroidite. Low carbon steels show a tendency to transform to pearlite rather than to spheroidite if the austenitizing temperature is raised too far above the Ac_1 point. Slow cooling cycles for plain carbon tool steels are described in detail. (3) Spheroidizing by isothermal transformation, where the sub-critical temperature must be not more than 45° C. below the Ac_1 point in order to obtain a spheroidal product. These methods can also be applied successfully to alloy steels. The elimination of decarburization constitutes a difficult problem in this treatment. A certain amount of graphitization of cementite often occurs. Spheroidizing is carried out to improve cold working properties, machinability, and the structure after a final hardening. Some of the faulty structures likely to be produced are also discussed. 34 ref.

18-106. **The Isothermal Transformation of Alloy Tool Steel.** A. N. Alimov, N. N. Lipchin and N. F. Sivkov. *Katshestvennaia Stal*, no. 2, 1937, pp. 37-40. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 127-A.

An account of tests made on alloy steels for forging into tools with a view to reducing the time required for heat treatment. The five steels used were: (1) A 12% chromium steel; (2) a low alloy chromium-nickel-molybdenum steel; (3) a 1.20% chromium, 1.70% tungsten steel; (4) an 8.40% tungsten, 2.53% chromium, 0.33% vanadium steel; and (5) a 17.5% tungsten, 3.90% chromium steel. Satisfactory heat treatments were developed which involved holding at 860 to 900° C. for 1 to 1½ hr. followed by holding at a subcritical temperature for not more than 4 hr. The total heat treatment time was reduced by about 60% as compared with the former methods.

18-107. **The Selection of a Quenching Oil for Hardening Steel.** H. Krainer and K. Swoboda. *Archiv. fur das Eisenhuttenwesen*, v. 17, Jan.-Feb., '44, pp. 163-169. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 128-A.

A. Rose has previously constructed characteristic curves for different quenching media which depict the changes in cooling velocity at the center of a silver ball when quenched from 800° C. (see Iron & Steel Institute *Journal*, 1939, no. II, p. 272-A.) In the present paper, experiments are reported in which the cooling rates at the center of steel plates from 25 to 200 mm. thick when quenched in different oils and in water were first calculated using Rose's curves, and then checked by making hardness determinations and examining the microstructure of the quenched steels. The steels used included a chromium-molybdenum steel, a chromium-vanadium steel and two chromium-manganese steels. The calculated and experimental results were in good agreement.

18-108. **Heat Treating Stainless Steels.** *Steel*, v. 116, April 23, '45, pp. 88-89.

Covers straight chromium and chromium-nickel non-hardenable grades.

18-109. **Danger of Failure in Welded Structures Greatly Reduced by Low-Temperature Stress Relief.** T. W. Greene and A. A. Holzbaur. *Steel*, v. 116, April 23, '45, pp. 110, 142, 144.

Low cost, non-detrimental application of heat ranging from 350 to 400° F. relieves both longitudinal and transverse stresses. Minimum yield point value affords durability and safety in shipbuilding.

18-110. **Induction Heating of Moving Magnetic Strip.** R. M. Baker. *Electrical Engineering*, v. 64, April '45, pp. 184-189.

General problem of heating iron or steel strip by induction is analyzed to arrive at equations for power-factor efficiency and density of heating under all conditions. Certain general curves are shown to illustrate the limitations of strip thickness, frequency, and density of heating. 3 ref.

18-111. **Hardening and Shrink Fitting.** *Steel*, v. 116, April 30, '45, pp. 92-93, 128, 130.

Operations are performed simultaneously with induction heating in assembling 3-piece track rollers.

18-112. **Stress Relief of Weldments for Machining Stability.** J. R. Stitt. *Machine Design*, v. 17, May '45, pp. 113-114.

Determining the quantitative effect of temperature on the degree of stress relief obtained.

18-113. **Measurement of Case Depths by Martensite Formation.** E. S. Rowland and S. R. Lyle. *Metal Progress*, v. 47, May '45, pp. 907-912.

Accurate method to measure the depth to the 0.40 to 0.50% carbon level on hardened microsections.

18-114. **Gas Furnaces for Interrupted Quenching.** A. H. Koch. *Metal Progress*, v. 47, May '45, pp. 921-925.

Steel must be heated to and held at a temperature above its upper critical long enough to transform and diffuse it into an austenitic structure as homogeneous as practically possible. For proper and uniform response to any rapid cooling the austenite must be uniform. The time required for the transformation of austenite to start, and to be completed, is dependent upon the analysis of the steel and the temperature at which the steel is held. Use of salt baths, lead hardening furnaces, and controlled atmosphere furnaces. Salt quench furnace.

18-115. **Quenching Oils.** Blaine B. Wescott and L. W. Vollmer. *Metal Progress*, v. 47, May '45, pp. 935-936.

Takes issue with some of Metallurgicus's opinions on quenching oils.

19. WORKING

Rolling, Drawing, Pressing, Forging

19-126. **Roll Forming of Magnesium Alloys.** John M. Thompson. *Iron Age*, v. 155, April 26, '45, pp. 53-55.

Forming of magnesium sheet into structural shapes by the Yoder roll forming method. Results of tests indicated that the alloy AM-C52S-O, or its equivalent Fs-la, had the optimum combination of compressive yield strength and formability. It was found that the yield strength of this alloy could be increased an appreciable amount by stretching, the increase being proportional to the percentage of stretch imposed upon the material.

19-127. **Roller Leveling Increases Output in Rubber-Press Department.** Frank Kubichek. *American Machinist*, v. 89, April 26, '45, pp. 102-105.

Most of the trouble arising from warpage of aircraft parts formed in rubber tooling can be avoided by heat treating the blanks and then flattening them by machine.

19-128. **Use of Sheet Magnesium Alloys Expanded by Hot-Forming Method.** Paul Hawley. *American Machinist*, v. 89, April 26, '45, pp. 106-107.

Heated dies assist in solving the problem of contour forming spoilers from magnesium alloys.

19-129. **An Introductory Study of the Mechanism of Plastic Deformation of Metals.** James L. Erickson. *Light Metal Age*, v. 3, April '45, pp. 12-15.

Knowledge of the principles of plastic deformation is valuable to all industries engaged in drawing, extruding, rolling, or otherwise forming metals. Discussion of subject with particular reference to aluminum and magnesium. The basic principles apply generally to all metals.

19-130. **Spinning of Magnesium.** George F. Farley. *Light Metal Age*, v. 3, April '45, p. 21.

Metal spinning has saved tooling-up time, avoided investments for expensive dies, speeded up delivery, decreased weight, and improved the appearance of products.

19-131. **Modern Aspects of Drop Forging.** Hans Haller. *Machinery* (London), v. 66, March 22, '45, pp. 313-317.

Discusses side tapers, recesses and other forms of curvature influencing the development of the drop forging and the material waste; the splitting process.

19-132. **Forging Aluminum Cylinder Heads at Chevrolet.** P. D. Aird. *Modern Industrial Press*, v. 7, April '45, pp. 18-20, 42.

From the time the 72-lb. aluminum billet is started through the pre-forming operations until it emerges as a finished part machined with exacting accuracy, it follows a direct line, pausing only to permit some phase of manufacture to be accomplished. There are two production lines operating in the plant and never do the two come together. In this way there is no chance of mixing front and rear sections at any stage in the process.

19-133. **The Rolling of Metals.** L. R. Underwood. *Sheet Metal Industries*, v. 21, April '45, pp. 613-619, 630.

Position of the neutral point for non-uniform pressure distribution between rolls and materials; effect of rolling temperature and composition on forward slip when rolling strip steel; effect of roll diameter on forward slip when cold rolling steel strip without lubricant; effect of rolling speed on forward slip (cold rolling lubricated strip); effect of roll roughness on forward slip (cold rolling steel strip); effect of width of strip on forward slip; effect of work-hardening on forward slip; effect of tension on forward slip; effect of roll flattening on the forward slip and the no-slip angle.

19-134. **Lighting the Small Power Press.** J. H. Nelson. *Sheet Metal Industries*, v. 21, April '45, pp. 633-635, 640.

Reasons for local lighting; polished metal surfaces; lighting unit. 1 ref.

19-135. **New Precision Forging Methods.** Hans Haller. *Machinery* (London), v. 66, April 5, '45, pp. 369-371.

Other considerations of drop forging discussed, commencing with the precision profiling of parts.

19-136. **Magnesium Alloy Fabrication.** J. V. Winkler. *Metal Industry*, v. 66, April 6, '45, pp. 213-216.

American practice in the hot forming of magnesium alloy sheet described in shortened version of a paper presented to the American Society for Metals. The fact that magnesium alloy sheet has to be hot worked is, it is claimed, an advantage since, in many cases, it allows parts to be drawn in one operation.

19-137. **Increasing the Life and Accuracy of Lamination Dies.** Guy M. Shingledecker. *Iron Age*, v. 155, May 3, '45, pp. 51-54, 135.

Experience gained in the production of electrical steel laminations at Allegheny Ludlum Steel Corp. has aided in the development of dies of long and accurate life, in the selection of suitable steels and in blanking practices.

19-138. **Constructing, Grinding and Operating Progressive Dies.** C. W. Hinman. *Steel Processing*, v. 31, April '45, pp. 238-239, 262.

Reason for the popularity of progressive dies is their high speed production economy of work material, and their trouble-free operation after being adjusted to the work. Order of die operations; precision limits; construction.

19-139. **Discussion Proceeds on Reactive Wire Drawing.** *Wire Industry*, v. 12, April '45, pp. 191-193.

An experimental machine, incorporating the principle of imparting a backward pull to prestress the wire and thus lessen the work of the die, is being built. Yield point could not be the arithmetical mean of the yield points before and after the draft, on account of age-hardening. A mild-steel wire tested at intervals after cold drawing showed a considerable increase of both the yield point and the ultimate strength.

19-140. **Light Metal Rolling.** O. Emicke. *Metal Industry*, v. 66, April 20, '45, pp. 245-246.

Power requirements in the hot and cold rolling of light metal sheet. (Translated from *VDI Zeitschrift*, v. 28, 1943, p. 435.)

19-141. **Drawing Magnesium: New Processes Applied to Forming Sheet Magnesium.** Kenneth Allen. *Production Engineering & Management*, v. 15, May '45, pp. 101-102, 104, 106.

Forming deep-drawn magnesium parts through use of mating die and punch. Blanks are pre-heated before being inserted in press.

19-142. **Increasing the Power on Existing Cold Strip Mills.** F. R. Burt and B. J. Auburn. *Iron & Steel Engineer*, v. 22, April '45, pp. 46-52.

So rapid has been the development of cold strip mills that many of the earlier mills are economically obsolete. Higher speeds, which will benefit many of these mills, may be possible of attainment through various means.

19-143. **Deep Drawing Magnesium Domes.** J. Walter Gulliksen. *Metals & Alloys*, v. 21, April '45, pp. 986-990.

New development of considerable importance to the future use of magnesium sheet is the successful technique of hot deep drawing magnesium propeller domes from heavy gage stock. Involves a whole series of press operations, including "ironing" of the sidewall, indenting and "upsetting" as well as a "double action" draw press operation. Design of the dome, alloy, lubrication and cleaning covered.

19-144. **Forging of Magnesium Alloys.** James C. Hartley. *Light Metal Age*, v. 3, April '45, pp. 8-11, 30-31, 35.

Hammer and mechanical press forging present certain economies over more expensive methods. Description of methods for achieving best results with these methods, as well as valuable fundamental information on the subject of forging magnesium.

19-145. **Magnesium Alloy Fabrication.** J. V. Winkler. *Metal Industry*, v. 66, April 13, '45, pp. 226-229.

Technique required for hot forming magnesium alloy sheet. Claimed that it is possible to hot spin any shape in annealed magnesium alloy sheet that can be spun from pure aluminum. (From American Society for Metals.)

19-146. **Safety Is Good Business, II.** John E. Hyler. *Modern Machine Shop*, v. 17, May '45, pp. 160, 162, 164, 166, 168, 170, 172, 174.

Devices for guarding power presses.

19-147. **Deep Drawing Magnesium Alloy Sheets.** L. J. Weber and H. Vanden Berg. *Iron Age*, v. 155, May 10, '45, pp. 70-74, 142-143.

Tests made on three grades of magnesium alloys indicate that reductions in blank diameter from 50 to 55% are possible in cupping operations performed in double action mechanical presses, provided the material is heated to 500 to 550° F. In redrawing shells, reductions up to 50% are possible, giving overall reductions of 77.5%.

19-148. **Cold Heading Improves Machine Parts.** John S. Davey. *Fasteners*, v. 2, no. 1, pp. 14-17.

Process offers many advantages in production and economy.

19-149. **Methods of Increasing the Production and Improving the Operation of a Cold Rolling Mill.** T. Thiemann. *Stahl und Eisen*, v. 64, Dec. 7, '44, pp. 763-774. Iron & Steel Institute *Bulletin*, no. 111, March '45, p. 127-A.

Numerous improvements to the equipment of a mill for cold rolling, annealing and pickling coils of strip are described and illustrated.

19-150. **Practical Problems of Light Presswork Production.** J. A. Grainger. *Sheet Metal Industries*, v. 21, April '45, pp. 636-640.

Correct die clearances; setting stops and safety stops; setting the tools—danger of and damage through oversetting; choosing the press—press speed.

19-151. **Stretch Forming Developments.** *Modern Metals*, v. 1, May '45, pp. 19-20.

Stretch-forming is rapidly becoming a popular method where close tolerances of special contour panels must be maintained. Offers some unusual advantages in the manufacture of automobile parts, after the war.

19-152. **Aluminum Press Forgings by Chevrolet.** Frank J. Oliver. *Iron Age*, v. 155, May 17, '45, pp. 48-55.

Manufacture of forged aluminum aircraft engine cylinder heads exemplifies some of the techniques of press forging of large components. Some of the practices worked out on other aircraft parts while awaiting the go-ahead on the job for which an unusual array of heavy press equipment was installed.

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A.S.M. Review of Current Metal Literature — *Continued*

20. MACHINING AND MACHINE TOOLS

20-140. **Inspection Paces Production.** *Production Engineering and Management*, v. 15, April '45, pp. 84-85.

Design of special slotting jig increased machining of two 0.031-in. slots, of different depths, from 80 to 1200 parts per day.

20-141. **Choice of Carbide Grades.** *Iron Age*, v. 155, April 26, '45, pp. 68-69.

As part of a program of developing standards for machining various metals with cemented carbide tools the standards department of the Crane Co., Chicago, took the initial step of selecting what their experience taught is the most suitable grade of carbide for each application.

20-142. **Simple Inexpensive Tools Produce Fragmentation Bombs.** *American Machinist*, v. 89, April 26, '45, pp. 110-112.

Automatic chucking machines are equipped with a special tapping spindle and work-holding fixture for operations on the bomb head.

20-143. **Sharpening Face Mills and Form Relieved Milling Cutters.** M. Martellotti. *American Machinist*, v. 89, April 26, '45, pp. 114-117.

Description of sharpening methods with details on the handling of face mills and form relieved cutters.

20-144. **Canadian Plant Avoids Handwork in Making Torpedo Propellers.** Chester S. Ricker. *American Machinist*, v. 89, April 26, '45, pp. 121-126.

Modern profiling equipment was chosen for rough machining the blade contours, but finishing operations are performed upon ingenious machines designed by the company's tool engineers.

Here is the second volume of the Rustless Library of Stainless Steel Information—"Machining of Stainless Steels." This is an 84-page reference book, thumb-indexed, and includes all phases of its subject. Designed especially for machinists, machine shop operators, layout engineers and time-study men. There are five main sections, giving all needed data for various grades of stainless, plus information on machine tool equipment, speeds, feeds, specific operations such as turning, forming, drilling, tapping, threading, reaming, etc., tool designs, tool compositions, cutting fluids and helpful tables for machinists.

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20-145. **Rigid and Swivel-Type Fixtures Used in Honing Precision Parts.** W. H. Harris. *American Machinist*, v. 89, April 26, '45, pp. 127-130.

Indexing fixtures and provision for automatic positioning and ejection of workpiece speeds the pace of honing operations.

20-146. **Practical Ideas.** *American Machinist*, v. 89, April 26, '45, pp. 131-136.

Gage permits quick set-up regardless of drill length. Adjusting screw in ram of hydraulic press avoids blocking. Continuous tinning reservoir for soldering iron stand. Bushing screw jack useful for pressing bearings into position. Bench tool strips armor from electric cable. Angle clipping jig for shear increases output and safety. Lathe operations simplified by planer toolholder. Bakelite headed metal studs deburred by tumbling. Pipe-slotting attachment for milling machine. Welder's pipe handwheel is a safe and useful attachment. Expanding tool holds pins for gaging internal gears. Mechanic's squares refinished to restore calibration visibility.

20-147. **Close Tolerance Groove Tooling.** A. W. Ehlers. *Tool & Die Journal*, v. 11, April '45, pp. 95-97, 112.

Tolerance restrictions of width, depth and taper angle must be met with a single point cutting tool. Summarizes data which may prove useful in attacking specific applications.

20-148. **Selecting Carbides for Milling.** Fred W. Lucht. *Tool & Die Journal*, v. 11, April '45, pp. 98-100, 112, 114.

Grinding; cutter design; setup; feeds and speeds; vibration and chatter grade selection; steel milling; other materials.

20-149. **The Art of Metal Cutting, VI.** *Machine Tool Blue Book*, v. 41, May '45, pp. 135-136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 160, 162.

Discussion of the steps involved in conversion to carbide tooling. Following the procedures recommended will result in a better understanding of the requirements of modern carbide tooling—and the improved performance attainable thereby.

20-150. **Rake Conversion Chart for Single-Point Cutting Tools.** D. F. Galloway. *Machinery* (London), v. 66, April 5, '45, pp. 374-376.

Three systems for the measurement and specification of single-point cutting-tool angles.

20-151. **Machining Brass.** W. Stern. *Metal Industry*, v. 66, March 30, '45, pp. 194-196.

Where appearance is of extreme importance, the use of a diamond tool will speedily justify the extra cost, particularly so, where, for any reason, interrupted cuts have to be made. Examples of the saving which can be made by the judicious use of diamonds for highly finished or very thin work. 7 ref.

20-152. **Designing of "Trouble-Free" Dies, XLVII.** C. W. Hinman. *Modern Industrial Press*, v. 7, April '45, p. 26.

Practical designs for drilling, milling, and tapping tools.

20-153. **Segment Sawing at Lockheed.** Jack L. McGraw. *Modern Industrial Press*, v. 7, April '45, pp. 31-32.

Specialized saws to accurately and rapidly trim contoured aluminum parts. The "pivotal" saw for trimming coordinated engine nose cowl thrust rings has eliminated "tailoring" (hand filing and grinding until segments mate along trim lines) and easily produces perfectly matched sections.

20-154. **Faster and Better Milling.** A. O. Schmidt. *Steel*, v. 116, May 7, '45, pp. 107, 164, 166, 168, 170, 172, 174.

Thermodynamic research. 6 ref.

20-155. **Ship-Propeller Milling with Tracer Control.** H. Earl Morton and G. A. Caldwell. *Westinghouse Engineer*, v. 5, May '45, pp. 72-76.

The machine tool is astoundingly accurate, fast, automatic, repetitive. New type of electrical control gives to the machine tool a sense of touch by which it can feel the contours of a model and sculpture its exact likeness many times enlarged in metal.

20-156. **Enlarged Center Distance System for Improved Gear Tooth Forms.** Merhyle F. Spotts. *Product Engineering*, v. 16, May '45, pp. 339-343.

Method for designing spur gears which are to be generated with a cutting rack or hob that eliminates undercutting the flanks of pinions having a small number of teeth. Equations are developed for non-standard pitch circles, tooth thicknesses, pressure angles, blank diameters and cutter settings.

20-157. **Casting and Machining Iron Crankshafts.** J. G. Bergdoll. *Metals & Alloys*, v. 21, April '45, pp. 994-999.

An example of cast iron's serviceability as a heavy-duty engineering material is its increasing use for crankshafts. An important factor here is its machinability and general ease and economy of working, graphically demonstrated in a picture story of the casting and machining operations done at York Corp. to produce Meehanite crankshafts.

20-158. **Super High Speed Cutting of Metals.** V. D. Kuznetsov. *Iron Age*, v. 155, May 10, '45, pp. 66-69, 142.

Theoretical considerations confirmed by experimental results indicate that the energy consumed in cutting is primarily made up of work done in plastic and elastic deformation. With increasing speed a metal tends to behave more and more as a brittle material, with plastic deformation and hence energy consumption becoming less and less. Turning tests on steel at 4900 ft. per min. showed little heat was generated. Cast iron and aluminum behaved like brittle materials when milled at high speeds, while carbon steel and copper did not. (From *Vestnik Metallopromyshlennosti*, 1940, no. 7.) 6 ref.

20-159. **Grinding Wheel Selection.** M. Martellotti. *American Machinist*, v. 89, May 10, '45, pp. 106-108.

Grinding wheel designations and recommends the types best for cutter sharpening.

20-160. **Adjustable Magazine Feed Developed for Screw Machines.** Harry L. Giwosky. *American Machinist*, v. 89, May 10, '45, p. 109.

Adjustable for parts of different lengths and different diameters. Magazine feed assembly designed for mounting on a No. 2-G Brown & Sharpe automatic screw machine. The feed block is clamped on the cross-slide of the machine so that the work-pieces are individually transferred from the bottom of the feed chute to the collet chuck in the spindle.

20-161. **Stock Removal by Lapping Proves Feasible for Small Parts.** Norman Gray. *American Machinist*, v. 89, May 10, '45, pp. 110-111.

Corners on the comb teeth of the inner shearing member of the 2-M shaver are formed on a multi-ribbed lapping wheel. The operator places the piece in a loosely mounted holder and guides it so that the comb slots lip over the ribs on the wheel. Clover No. 2A grinding and lapping compound is applied to the wheel at intervals. Production exceeds 100 pieces per hour.

20-162. **Special Boring and Tapping Machines Finish Seamless Steel Bomb Bodies.** *American Machinist*, v. 89, May 10, '45, pp. 112-114.

Machines powered from a central hydraulic system. Leadscrews insure accurate tapping of bombs at each end.

20-163. **Practical Ideas.** *American Machinist*, v. 89, May 10, '45, pp. 119-124.

Large-radius cams ground by milling-machine attachment. Stud threading diehead used in a drill press. Three-hole locating gage for checking size and position. Rivet spinning attachment for drill press spindles. Air-blown chips from spindle bore collected during cleaning. Tight skin-plate joints made with portable hand former. Engine lathe converted to an accurate cam miller. Slotter toolholder takes interchangeable bits. Bench press slowed for forming operations. Power hacksaw attachment for accurate angular cuts.

20-164. **Small Precision Lathes for High Production.** John E. Hyler, *Production Engineering & Management*, v. 15, May '45, pp. 67-70.

Bench lathes, emphasizing the versatility of these machines which combine high production with accuracy. Quick-chucking devices, taper-turning attachments, and turret operation highlighted in a discussion covering range and capacity of equipment.

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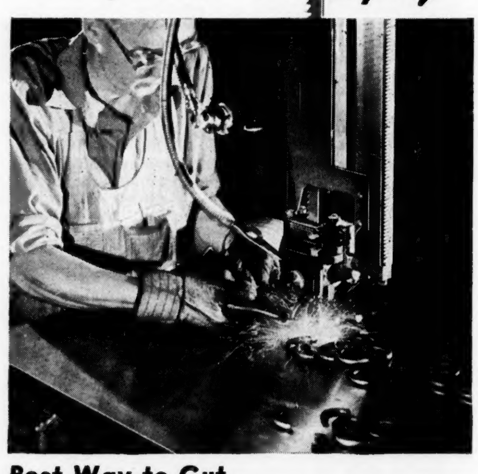

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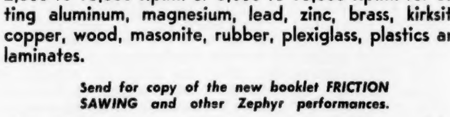

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20-165. **Engineered Carbide Program Pays Dividends.** *Production Engineering & Management*, v. 15, May '45, pp. 72-76.

Successful machining of aluminum and hard-steel alloys at high speeds demands tool design based upon careful analysis of machines and jobs.

20-166. **Auto Builder Produces 3-Piece Crankshaft.** *Production Engineering & Management*, v. 15, May '45, pp. 77-78.

Grinding front section of crankshaft to precision which will balance with other sections in final assembly.

20-167. **Quantity Production and Checking of Parts Requiring Compound Angles.** Frederick W. Plapp. *Machinery*, v. 51, May '45, pp. 158-165.

Solution of compound-angle problems. Computing, dimensioning, and checking of compound angles during tooling and inspection.

20-168. **Multiple Spindle Heads.** C. A. Hoefer. *Steel*, v. 116, May 14, '45, pp. 106-107, 140, 142.

Permit great increase in production; up to 61 or more holes simultaneously drilled in one operation; multiple station setups increase output still more.

20-169. **Broaching of Machine Gun Barrels.** Edwin Laird Cady. *Metals & Alloys*, v. 21, Feb. '45, pp. 388-391.

Describes the process as used at Springfield, with emphasis on the engineering problems that have already been solved and especially on those whose solution, yet to come, will be followed by a remarkable expansion in use of broaching.

20-170. **Bell Aircraft Uses Turret-Head Press for Many Punching and Cutting Operations.** *Steel*, v. 116, April 23, '45, p. 100.

Wiedemann power driven turret punch press which carries 17 punches and dies on the rotating head making it possible to punch different-sized holes on same piece of stock without inserting new die.

20-171. **Machining, Finishing and Testing Die Castings.** H. E. Nagle. *Steel*, v. 116, April 30, '45, pp. 94-96, 98, 100.

Tooling setups; methods for applying organic finishes and testing castings for quality.

20-172. **Hobbing Operation.** Carlton A. Sheffield. *Steel*, v. 116, April 30, '45, pp. 104, 107-108.

Accomplished at high speed on modified machine, using flywheel and composite cutter equipped with tungsten carbide strip teeth.

21. LUBRICATION AND FRICTION; BEARINGS

21-35. **Oil Grooves in Plain Bearings.** D. Clayton. *Engineering*, v. 159, March 2, '45, pp. 178-180.

General behavior: (a) The coefficient of friction is low (generally less than 0.002). (b) Increase of speed leads to higher feed under all conditions, and to a slightly higher coefficient of friction; the latter actually indicates a greater safety, the decrease of viscosity due to rise of temperature not quite wholly compensating for the increase of speed. (c) The rate of change of bearing temperature with change of oil flow through the bearing very rapidly decreases as the quantity increases, the flow-temperature curve being hyperbolic in shape; so that cooling a bearing in this range of conditions by either pumping an excess of oil through it or cutting grooves to promote flow seems rapidly to become inefficient. The viscosity value, which represents, for constant other conditions, a rough measure of safety of the bearing, changes only 25% for the 8° C. (14° F.) lowering of the temperatures effected by cutting a 1½-in. axial groove at the bottom when the feed increases from 6 fluid oz. to 18½ fluid oz. per min. On the other hand, if a hole at 90° on the outlet side is replaced by one at the bottom, the temperature change is such that the safety increases by 75% or more for a four-fold increase of flow.

21-36. **Put It There.** Lee T. Miller. *Die Casting*, v. 3, April '45, pp. 20-21, 54-56.

Lubricating devices with die cast parts. Confronted with the necessity of maintaining a smooth exterior and with the object of a relatively simple die, the location of essential openings and bosses became important. Here's how it was done.

21-37. **Lubrication of Portable Air Tools.** A. F. Brewer. *Areo Digest*, v. 49, April 15, '45, pp. 90-93, 179-180.

Precise mechanisms; valve-controlled tools; air strainers; moisture causes rust; preventive maintenance.

21-38. **Chemistry and Prevention of Piston-Ring Sticking.** G. H. Denison and J. O. Clayton. *SAE Journal*, v. 53, May '45, pp. 264-268.

Oxidation of lubricating oils produces, among other products, oxy-acids, which constitute the source of ring sticking because of a tendency to turn into insoluble deposits. Chemical explanation of this phenomenon is given, so that it may prove useful in implementing the design of non-corrosive, anti-ring-sticking additives for heavy-duty oils.

21-39. **Corrosion Resistant Anti-Friction Bearings.** H. Habart. *Iron Age*, v. 155, April 19, '45, p. 70.

Corrosion resistant metals are being used in increasing quantities for the manufacture of anti-friction bearings. In general, these metals are divided into three classes: monel alloys, stainless steels and beryllium copper. Gives uses, advantages and disadvantages for each.

21-40. **Predicting Power Losses in Journal Bearings.** Charles D. Wilson. *Machine Design*, v. 17, May '45, pp. 125-130.

Power losses in large bearings are influenced by the rate of oil circulation and by the design of the unloaded portion of the bearing. Estimation of this worked out using curves derived from calculation and interpretation of test data discussed.

22. JOINING

Welding; Brazing; Flame Cutting; Riveting

22-215. **Silver Alloy Brazing.** A. M. Setapen. *Metal Industry*, v. 66, March 30, '45, pp. 198-200.

Design of single and multi-turn induction coils for specific purposes. Simplicity of operation, low cost, high speed and control of heat are the advantages claimed for this method of silver alloy brazing. (Electrochemical Society.)

22-216. **Automatic Arc Welding.** R. F. W. *Machinery* (London), v. 66, April 5, '45, pp. 361-366.

Improved automatic arc-welding machines and equipment are capable of reducing costs, increasing production, and improving quality.

22-217. **Dissimilar Metals.** *Iron & Steel*, v. 18, April '45, p. 123.

Joining by electric arc welding.

22-218. **The Strength of Riveted Joints.** I. G. Bowen. *Aircraft Engineering*, v. 17, March '45, pp. 83-87.

Results of a statistical analysis of test data.

22-219. **Identifying the Constituents of Welding Electrode Coatings.** R. C. Vickery. *Iron Age*, v. 155, April 19, '45, pp. 62-66.

Scheme involving magnetic and gravitational separation that gives surprisingly accurate results. (From *Metallurgia*.)

22-220. **Automatic Carbon Arc Welding Found Advantageous for Aluminum.** W. J. Conley. *American Machinist*, v. 89, April 26, '45, pp. 118-120.

Fabrication by the carbon arc method promises to widen the field of use of aluminum and its alloys. Method permits faster and more uniform welds.

22-221. **Fabrication Cost of Boilers, Tanks and Pressure Vessels as Affected by Plate Widths.** W. G. Theisinger. *Welding Journal*, v. 24, April '45, pp. 327-337.

Costs of unnecessary fabricating operations; fabricating costs and width extras; multiple-course construction; saving man-hours in fabrication; field inspection of joints; allowable overweight of plates; width extras and low alloy steels; one-piece crown and side construction in locomotive fireboxes; plate widths in clad steels; solid stainless and non-ferrous metals.

22-222. **Procedure Control of Automatic Welding Processes.** A. E. Bedell and J. B. Quigley. *Welding Journal*, v. 24, April '45, pp. 339-345.

Discussion confined to such automatic machine welding processes as are suitable for heavy plate fabrication of mild and certain alloy steels. Processes may be divided into three general types: Shielded metallic arc, completely shielded submerged arc and carbon arc-shielded. Discusses briefly the outstanding advantages and disadvantages of each of these general types on various classes of work.

22-223. **Production Planning for Welded Ship Construction with Paper and Plastic.** *Welding Journal*, v. 24, April '45, pp. 347-350.

With the aid of a scale plastic model which has been lofted to exact measurements, all parts of ship have been carefully planned and an erection program outlined.

22-224. **Organized Fitting and Welding in Shipbuilding.** Milton Forman. *Welding Journal*, v. 24, April '45, pp. 351-357.

Planning vs. work; sequence.

22-225. **Chemical and Metallurgical Control in Welding.** E. C. White. *Welding Journal*, v. 24, April '45, pp. 361-363.

Chemical and metallurgical division in a welding department should be staffed with personnel of broad experience and sound technical background in chemistry and metallurgy. Speedy metallurgical preparation of test information is absolutely necessary. All supervisors must arrive at a sound appraisal of the relative importance of macro sections, tensile tests, visual inspection of welds, etc.

22-226. **Unusual Applications of Gas Cutting to Ordnance Fabrication.** C. M. Underwood. *Welding Journal*, v. 24, April '45, pp. 365-377.

Designing for welding; multiplane cutting; cutting on base ring structurals; travograph set-up on base ring; vertical cutting; smaller cutting operations; tube cutting machine; special pantograph; contour beveling attachment; finishing cuts on weldments.

22-227. **Helium-Shielded Arc Welding.** L. V. Barber and H. S. Kennedy. *Welding Journal*, v. 24, April '45, pp. 378-380.

Helium-shielded arc welding contributed to the greatly expanded use of magnesium and its alloys in industry because of the affinity of magnesium for oxygen and nitrogen, especially at high temperatures. Welding of magnesium and its alloys was impossible before the process of welding in an inert-gas atmosphere was introduced. Details of process given. Application to stainless steel.

22-228. **Gas Evolution in Arc Welding Steels and Its Effects Upon the Welding Process.** Morton C. Smith. *Welding Journal*, v. 24, April '45, pp. 226s-229s.

Gas evolution during the arc welding of steels discussed on the basis of the type and quantity of gas liberated; it is demonstrated that a large volume of carbon monoxide must normally be evolved from molten filler and weld metal during the welding process in air. Evolution of carbon monoxide from the metal is suggested as the primary cause of metal transfer across the arc in vertical and overhead welding, of spatter loss of weld metal, of the formation of the welding crater, and of porosity in the completed weld. 6 ref.

22-229. **Weldability of Manganese-Silicon High Tensile Steels.** George G. Luther, Francis H. Laxar and Clarence E. Jackson. *Welding Journal*, v. 24, April '45, pp. 245s-254s.

Weldability of the experimental manganese-silicon steels without titanium or vanadium is superior to that of commercial carbon-manganese steels and compares favorably with that of commercial carbon-manganese steels with additions of vanadium and titanium. Manganese-silicon steels have less tendency for underbead cracking. No cracking tendency was evident for experimental manganese-silicon steels. 4 ref.

22-230. **Welded Locomotive Boiler Construction.** James Partington. *Railway Age*, v. 118, April 28, '45, pp. 752-753.

Railroads must be proponents of all-welded boilers before this type of construction is widely used. Welding code adopted; steps to good welding; advantages of welded boilers; material.

22-231. **An Engineering Approach to Soldering with Tin-Lead Alloys, II.** A. Z. Mample. *Metals & Alloys*, v. 21, April '45, pp. 1000-1006.

Discusses fluxes, soldering devices and the mechanical quality of soldered joints, and presents a useful summary of the whole problem and practice for design, materials and process engineers.

22-232. **Which Carbon Steel for Arc Welding?** W. J. Conley. *Metals & Alloys*, v. 21, April '45, pp. 1006-1008.

Discussion of the composition grades of low-carbon steel that are best suited for high-speed manual arc welding. 4 ref.

22-233. **Welding Symbols.** *Metals & Alloys*, v. 21, April '45, pp. 1037-1039.

Diagram.

22-234. **Aircraft Welding.** H. O. Klinke. *Canadian Metals & Metallurgical Industries*, v. 8, April '45, p. 41.

Resistance welding; fusion welding; quality.

22-235. **Magnesium Alloy Fabrication.** J. V. Winkler. *Metal Industry*, v. 66, April 20, '45, pp. 248-250.

Reviews the various methods used to join magnesium alloy parts and discusses the processing involved in fabricating structures by these methods. (From American Society for Metals.)

22-236. **Some Safety Factors in Arc Welding.** R. F. Wyer. *Railway Signaling*, v. 38, May '45, pp. 316-318.

Hazards involved and the safety practices that should be observed in arc welding. Contrary to popular belief, arc welding is not a hazardous occupation, if the work is done in accordance with recommended safety rules.

22-237. **Spot Welding of Aluminized Steel.** Harry W. Brown. *Iron Age*, v. 155, April 26, '45, pp. 56-62.

This report presents in summarized form the results of research carried on to determine the spot welding characteristics of 0.0375-in. aluminized steel. The work was done at the University of Texas as a part of the author's Master's thesis in aeronautical engineering. Shear strengths averaging 1800 lb. and higher can be consistently obtained with a tip pressure of 700 lb. and 18,000 amp., using electrodes of 2 in. dome radius. 17 ref.

22-238. **Pack-Type Emergency Cutting Outfit Developed for Shipboard Use.** *Industry & Welding*, v. 18, May '45, pp. 33-34, 75.

Development of a new oxy-acetylene emergency cutting outfit for use under battle-damage conditions. Weighs only 56 lb. and is contained in a fire-resistant canvas-back pack.

22-239. **Cutting Perfect Circles with a Cutting Torch.** Lee Brady. *Industry & Welding*, v. 18, May '45, p. 35.

Device to cut perfect circles with an ordinary cutting torch. Two methods described.

22-240. **Welding for Profit—Not for Waste.** E. E. Gentry. *Industry & Welding*, v. 18, May '45, pp. 40-41.

In putting two pieces of steel together to be welded, one of the best methods to use is the wedge method.

22-241. **Spot by Spot.** *Industry & Welding*, v. 18, May '45, pp. 44-46, 52, 54, 56-57.

Sheets to be welded must be kept scrupulously clean, electrode surfaces must be frequently cleaned of pits and strict attention to water cooling of the electrodes is another "must." Shows how the welding machine efficiency is checked and other phases of the operation.

22-242. **Tubular Section Welding.** I. A. Oehler and R. E. Goodman. *Industry & Welding*, v. 18, May '45, pp. 48-49, 90-92.

Flash welding of aircraft parts has been of special importance during the wartime emergency, since the process relieves forging and machining capacity. The tubular section welded to end fittings has a bright future in all future construction where weight is a factor.

22-243. **Basic Joint Design for Welding Process, II.** *Industry & Welding*, v. 18, May '45, pp. 60-61, 72, 74.

Basic design applied to electric arc and resistance welding.

22-244. **Some Suggestions on the Fabrication of Stainless Steel.** Paul F. Voigt. *Steel Processing*, v. 31, April '45, pp. 217-221, 237.

Stainless steels, as determined by composition and metallurgical characteristics, may be divided into three groups—austenitic, ferritic, and martensitic, the steels in any one group being generally similar in properties. Special emphasis placed on welding the austenitic group.

22-245. **Glass-Lined Steel Fabrication.** G. L. Dawson. *Steel Processing*, v. 31, April 45, pp. 231-237.

Glass is fused directly to the steel, and might well be termed "glass-clad" steel construction, as a cross-section would be very similar to any clad steel material such as stainless clad. Problems of fabrication by welding discussed.

22-246. **Welding Insures Leak-Proof Seams in P-38 Drop Tanks.** *Steel Processing*, v. 31, April '45, pp. 240-241, 261-262.

High production rate is achieved by coordinating stationary and moving production lines. The half-shells are stamped and drawn and moved to the production area where they undergo a series of welding, assembly and finishing operations.

22-247. **Electric Brazing.** A. K. Phillippi. *Steel Processing*, v. 31, April '45, pp. 243-249.

Selection of brazing metal; brazing temperature range; heating for brazing; furnace brazing; superiority of controlled atmosphere brazing.

22-248. **Gas and Heliarc Welding of Magnesium Alloys.** F. E. Heatley. *Iron Age*, v. 155, May 3, '45, pp. 64-66.

Tests made in Heliarc and oxy-acetylene welding on currently available magnesium sheet indicate a higher percentage of efficiency for the Heliarc method.

22-249. **Power Supply for A.C. Arc Welding.** A. U. Welch and R. F. Wyer. *General Electric Review*, v. 48, May '45, pp. 41-49.

Load characteristics of this rapidly growing type of welding, and the effects that the welders have on the power-supply circuits.

22-250. **Present-Day Brazing Production Possibilities.** Arthur N. Kugler. *Machinery*, v. 51, May '45, pp. 139-148, 155.

Brazing operations outlined, which were developed under wartime conditions and indicate the wide possibilities of the process when the country returns to the fabrication of peacetime products.

22-251. **Continuous Welding of Tubular Containers.** R. V. Anderson. *Machinery*, v. 51, May '45, pp. 149-154.

How cylindrical containers are welded at a rapid rate, by a process known as "submerged melt" welding.

22-252. **The Welding of Process Piping, IV.** Arthur N. Kugler. *Heating & Ventilating*, v. 42, May '45, pp. 89-93.

Welds in all positions possible; welds to cast iron; aluminum alloys; cast iron group.

22-253. **Basic Definitions of Welding Technology.** C. H. Jennings. *Machine Tool Blue Book*, v. 41, May '45, pp. 199-200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220.

At the present time welding is accomplished in five principal ways: (1) Forge welding, (2) gas welding, (3) thermit welding, (4) electric arc welding and (5) resistance welding. Discussion is primarily concerned only with resistance welding.

Widely used throughout military aircraft. May be used over and over again. Sizes from ½" O.D. up. In writing for samples, please give outside diameter of hose with fitting inserted.

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Metal Literature Review—*Continued*

22. JOINING (*Cont.*)

22-254. **Developments in Welding Technique.** *British Steelmaker*, v. 11, April '45, pp. 178-180.
Welding various metal combinations.

22-255. **Note on Design Stresses in Class I Welded Pressure Vessels.** S. F. Dorey. Institution of Mechanical Engineers, Dec. 15, '44. *Engineer's Digest* (American Edition), v. 2, April '45, pp. 183-184.
Realization and simplification of strength formulae appears desirable. Strength of the weld should be considered as equal to the parent plate. Use of multiplying factors dependent on conditions is unnecessary.

22-256. **Helium-Shielded Arc Welding of Aluminum Alloys.** F. Masdeo. *Product Engineering*, v. 16, May '45, pp. 331-333.
Advantages of helium-shielded arc welding of low and high-strength aluminum alloys. Joint design, properties of welds, test methods and development procedure described.

22-257. **Shell Case Output Doubled by Arc Welding Procedure.** *American Machinist*, v. 89, May 10, '45, p. 115.
Savings in time, material and manpower have been accomplished by improvements in fabricating technique. Arc welding method replaces a slower and more costly production method and improves the part quality.

22-258. **Flashwelding Proves Economical in Producing Crew Nacelle Spars.** J. L. Graux. *American Machinist*, v. 89, May 10, '45, pp. 116-118.
Flashwelding equipment replaces arc welding in the fabrication of critical aircraft parts on the Black Widow plane, and the spars are 20% stronger.

22-259. **Modern Fabrication Technique.** J. A. Dorrat. Institute of Welding *Transactions*, v. 8, Feb. 15, '45, pp. 3-8.
Welded fabrications of the general type. Choice of materials; electrodes; material preparation; joint design; constructional features; forgings; steel castings; pressings; heat treatment. 3 ref.

22-260. **Symposium on Welding After the War.** Institute of Welding *Transactions*, v. 8, Feb. 15, '45, pp. 9-18.
Engineering trends, by A. Dyson. Future technique in shipbuilding, by C. S. Lillicrap. Wide scope in manufacture of pressure vessels, by H. N. Pemberton. Applications in light alloys, by H. Sutton.

22-261. **Effect of Phosphorus on the Properties and Welding Characteristics of Arsenical and Non-Arsenical Copper and on Copper-Silver Alloy Filler Rod.** Maurice Cook. Institute of Welding *Transactions*, v. 8, Feb. 15, '45, pp. 19-27, 29.
Effect of small quantities of phosphorus on the properties and welding characteristics of both arsenical and non-arsenical copper, and on filler rod material, the range of phosphorus contents investigated covering amounts of the deoxidant likely to be present in the metal used for welding. Mechanical properties of the two varieties of copper in the annealed and cold rolled conditions, with phosphorus contents of from nil to 0.12 %, and their work hardening and annealing characteristics investigated. 3 ref.

22-262. **System of Indicating Welding Requirements of Engineering Drawings.** H. St. G. Gardner. Institute of Welding *Transactions*, v. 8, Feb. 15, '45, pp. 38-47.
Welding requires a definite degree of knowledge and experience on the part of everyone concerned, particularly the designers and draftsmen who decide on the process to be employed, and whose duty it is to see that details appear on the manufacturing drawings stating exactly what is required. This is the main purpose of the data given although brief explanations have been advanced for some of the requirements which it is hoped will assist in its use and develop greater interest among design office staff in the practical application of the various welding processes.

22-263. **Recrystallization Welding of Aluminum Alloys: Review of Literature to December, 1943.** J. B. Wilson. Institute of Welding *Transactions*, v. 8, Feb. 15, '45, pp. 48-49.
Hammer welding; pressure welding; applications of hammer and pressure welding; welding by recrystallization. 54 ref.

22-264. **New Adhesives for Built-Up Assemblies.** G. G. Havens and George Gordon. *Product Engineering*, v. 16, May '45, pp. 289-293.
Production and properties of Metlbond adhesives, including design data on shear, tensile strength, impact and corrosion resistance, as well as experimental and service test results.

22-265. **Electric Furnace Brazing—Its Principles and Practice.** A. K. Phillippi. *Westinghouse Engineer*, v. 5, May '45, pp. 84-89.
Art of fastening materials together is a fundamental function of industry which has limited or accelerated the pace of manufacturing as the art has lagged or led industry as a whole. New electric-brazing techniques in air or controlled atmospheres provide a noteworthy advance in joining metal, performing chores on a mass-production basis not possible by the application of other methods.

22-266. **Speed Welding with the Electric Metallic Arc.** *Steel*, v. 116, May 14, '45, pp. 112, 114, 156, 158, 160.
Faster speeds give greater penetration, while the slower speeds tend to build up more of the metal on the surface. A fillet weld with greater penetration, resulting from faster travel speed, appears smaller but greater than the weld made at slow speed with a sacrifice of penetration for build-up.

22-267. **Welding Corrosion Resistant Alloys to Protect Process Equipment, and Technique of Lining Pressure Vessels.** J. A. Gallaher. *Petroleum Refiner*, v. 24, April '45, pp. 106-113.
Discusses different practices that have been used, with the thought that plant designers and fabricators may be aided in decision as to which type seems best for the equipment involved. Deals with application and welding of one group of acid and corrosion resistant alloys. Obviously, the mechanics of installing the linings would apply to any metal used for such purpose, using appropriate materials and technique for the welding. (Before the Chicago Section of the American Welding Society.)

22-268. **Welding Rod Production.** *Steel*, v. 116, April 23, '45, pp. 97-98, 140.
Manganese alloy electrodes roll into final inspection station at rate of 350 per min. in new plant. Unusual die head, new type flux press and compact seven-pass oven are features of continuous unit which completely eliminates manual handling.

22-269. **The Power-Distribution Problem in Arc Welding.** H. W. Pierce and C. E. Smith. *Electrical Engineering*, v. 64, April '45, pp. 178-184.
Discusses briefly the general principles of power distribution for arc welding and illustrates the application of these principles in the provision of an adequate, flexible, and economical distribution system in a typical shipyard.

22-270. **Portable Welding "Guns."** G. W. Birdsall. *Steel*, v. 116, April 30, '45, pp. 86-90, 134, 136.
Twenty different types of guns facilitate spot welding in otherwise inaccessible places in intricate sheet metal assemblies.

22-271. **Silver Brazing in Aircraft Production.** J. P. Weed. *Iron Age*, v. 155, May 3, '45, pp. 56-60.
Because it requires less skill and training, silver brazing is replacing gas and arc welding in the fabrication of many of the smaller aircraft component assemblies. The various methods of silver brazing currently in use and the factors making for sound assemblies.

22-272. **Arc Welding of Rail Steel.** C. B. Haynes, William H. Graft and Raymond G. Spencer. *Metal Progress*, v. 47, May '45, pp. 912-915.
Application of the common welding methods to rail steel; general belief is that high carbon steels cannot be welded successfully without preheat and stress relief. Results warrant modification of this. Rail steel, and similar high carbon steels of the section weights discussed can be welded with high heat input rates and with a good degree of success without the precaution of preheat and stress relief. The static and dynamic strength and the ductility of such weldments are quite satisfactory for many applications.

22-273. **Bending and Straightening With the Torch, II.** *Industry & Welding*, v. 18, May '45, pp. 76, 78-82.
Flame straightening cuts costs, delays, shutdowns.

22-274. **Determination of Moisture in Electrode Coatings.** G. Haim. *Iron Age*, v. 155, May 17, '45, pp. 56-58.
New method for moisture determination in arc welding electrode coatings which is claimed to be superior to other methods as regards speed and simplicity. (Reprinted from the British journal *Welding*.)

23. INDUSTRIAL USES AND APPLICATIONS

23-101. **The Production of Hollow-Steel Aircraft Propeller Blades.** *Machinery* (London), v. 66, March 29, '45, pp. 341-344.
Welding, forging, brazing, and forming operations.

23-102. **Induction Heating at Chevrolet's Saginaw Plant.** *Modern Industrial Press*, v. 7, April '45, pp. 34-35.
Application of induction heating to the task of heating propeller blade hubs preparatory to the installation of a thrust bearing, and the subsequent upsetting operation.

23-103. **Die-Cast Products Can Recast Costs.** *Modern Industry*, v. 9, April 15, '45, pp. 45-47, 151-152.
Big parts, little parts, large lots, or small—there's almost no limit to the jobs die casting can do. It's ready to help find wider markets by turning out higher quality products at bargain prices.

23-104. **Metallurgical Aspects of Machine-Tool Castings.** J. G. Ritchie. *Foundry Trade Journal*, v. 75, March 29, '45, pp. 251-255.
Specifications and testing; improved wear resistance; hardening and tempering; stress relieving. 49 ref.

23-105. **Development of the Freight-Car Truck.** R. B. Cottrell. *Railway Age*, v. 118, May 5, '45, pp. 790-791, 793.
Sound design must be accompanied by effective structural and performance testing—conclusions drawn from such high-speed service tests as have been made.

23-106. **Cables and Wire for Military Aircraft.** *Wire & Wire Products*, v. 20, May '45, pp. 337-338.
Aircraft cables and wires are made of carbon steel and stainless steel and must conform to rigid specifications. Size of cables used for aircraft controls ranges from 1/16 to ¼ in. in diameter and the strands vary from 7 wires to a strand to 19 wires.

23-107. **Postwar Pistons.** Joseph Geschelin. *Automotive Industries*, v. 92, May 1, '45, pp. 33, 38.
What can the engine designer expect in pistons for postwar use? Survey among the leading producers of pistons leads to the conclusion that postwar progress is bound to be striking and will stem from experience gained from war production.

23-108. **Maintaining Quality of Small Arms Ammunition.** M. R. Wilson. *Canadian Metals & Metallurgical Industries*, v. 8, April '45, pp. 37-40.
System of quality control which would isolate any factor that might cause an excessive amount of process scrap or rejected cartridge lots. All raw materials accepted into the plant to be used for processing were held to specifications which would not cause defects at processing; secondly, it was necessary to maintain quality of each processing operation at a satisfactory level, and thirdly, provide accurate records of all rejects found.

23-109. **Aluminum and Magnesium Alloys in Light Engineering.** *Light Metals*, v. 8, April '45, pp. 155-168.
Applications of light metals for a wide variety of smaller structures where low deadweight is of primary importance.

23-110. **Method for Field Lining Vessel Heads with Stainless Steel Strip.** K. E. Luger. *Oil & Gas Journal*, v. 44, May 12, '45, pp. 92-94.
Method described for protecting refinery-vessel heads against corrosion has the virtue of economy and simplicity, requiring no elaborate detailing in the drafting room. Expense of shop fabrication may be eliminated, and field fitup time lowered because the small pieces allow flexibility. Waste from scrap is negligible.

(Continued on page 18)

NEW PRODUCTS IN REVIEW

NEW HIGH FREQUENCY HEATER

Climax Engineering Co., Clinton, Iowa

This company has announced its entry into the electronics field with the completion of preliminary engineering and the construction of pilot models. Actual production awaits approval of the War Production Board. The new product is known as the Climax high frequency heater.

This equipment will provide quick, efficient, localized heat for surface hardening, annealing and brazing. It is adaptable to the food industry and may be applied to all non-metallic materials. Climax expects to produce 12 models of standard electronic heaters and is establishing an Electronics Division for the manufacture, engineering, distribution and sales. Climax Division of General Finance Corp. was chosen to manufacture the electronic heater because it has a long history of experience in the electrical field and has produced a large number of products for use in the war effort. Established in 1916, the company is a manufacturer of gas, gasoline and diesel engines and generating sets.

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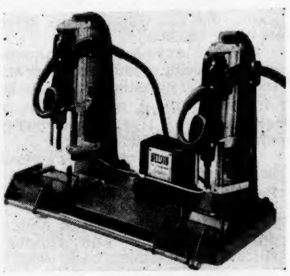
MULTIPLE STUD WELDER UNIT

Nelson Specialty Welding Equipment Corp.,
440 Peralta Ave., San Leandro, Calif.

This new automatic stud welding development to meet mass production requirements is known as the Nelson multiple stud welder production unit. The work is rapidly performed and the studs are held to very close tolerances.



Each of the welding guns is mounted on a pneumatic air cylinder. Each cylinder is fixed to a movable arbor which can be adjusted to any spacing necessary for the work. The work is held in a mandrel, chuck, or special locating device—the setup being determined by the particular production problem at hand. The welding current is obtained from a conventional 400-amp. generator, and is regulated by a timing control unit which automatically controls the length of arc flow, producing uniform and consistent welds.

This unit is operated with a single control switch. The work is inserted, stud is fitted into the chuck of each stud welding gun, and the control switch pressed. The first gun then descends, making a weld. Upon completion of this weld the next gun descends and welds. The guns then ascend automatically and the work is removed.

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INVESTMENT BONDING AGENT

Carbide and Carbon Chemicals Corp.,
30 East 42nd St., New York, N. Y.

Ethyl silicate is used in large quantities as an investment bonding agent for precision casting of special alloys. It is also useful to surface harden graphite and sand molds and as an acid-resistant binder for brick, mortar, and other refractories.

Porous sand molds coated with ethyl silicate solution are strengthened, hardened, and stiffened by the deposited silica. To obtain a smoother surface, some filler may be incorporated in the ethyl silicate solution. In the more accurate casting of such metals as magnesium, an ethyl silicate solution is used as a mold wash. For this purpose, it is sprayed on the inner surface of a conventional two-part sand mold and allowed to dry. Such treatment results in improved casting surfaces, without attendant sand inclusions.

The permanent graphite molds, used for making certain non-ferrous castings, deteriorate rather rapidly because of the action of the hot metal on the mold surface. Impregnating the surface of these molds with ethyl silicate solution should increase their life.

Steel castings are sometimes coated with finely ground ferrochrome by pouring the molten steel into sand molds coated with the ferrochrome. Ethyl silicate can be used to bond the powdered ferrochrome to the surface of the sand mold.

Ethyl silicate is mixed with water and with a denatured ethyl alcohol such as Synasol solvent, and the mixture is allowed to stand for about 12 hr. The aged solution can then be mixed with powdered ceramics to form a slurry, or diluted with alcohol, and sprayed on the surface to be hardened. Upon application of the solution, the alcohol is set free by gradual evaporation at room temperature, or it can be baked out, leaving a form of sticky colloidal silica that dries to a hard vitreous-like material. Such a cement or bond of pure silica is neutral, it does not dissolve in water, and it has no chemical action upon the surrounding material. It is acid-resistant and is not affected by high temperatures or by ordinary chemicals, except strong alkalies.

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UNIFORM THIN CASE HARDENING OF 24 PITCH STEEL GEARS

Federal Telephone and Radio Corp.,
67 Broad St., New York 4, N. Y.

Uniform, thin case contour hardening of steel gear teeth has been achieved by the application of high frequency energy in the megacycle range. This accomplishment, the result of proper timing, frequency and power with the gear rotating in the heating coil, provides accurate thin case hardening without loss of strength in the gear tooth. Chromium-molybdenum steel was used, although the process is not limited to this alloy and can be used equally well on other steels.

The gear treated was SAE 4140, with 51 teeth, an outside diameter of 2.208, a diametric pitch of 24 and a pitch diameter of 2.125. The equipment used was Federal's 25-kw. Megatherm induction heating unit which gave a case 0.005 in. deep, in $\frac{1}{4}$ of one sec. hardened to Rockwell C-58 to 60.

The complete operation for case hardening a gear by high frequency energy consists of placing it on a rotating shaft within the loading coil, revolving it at a predetermined speed for a preset period of time and then dropping it into the quench. The purpose of rotating the gear is to insure that the average distance between any point on its surface and the coil is the same. Since the current at any point on the surface of the gear depends upon its distance from the coil, a uniform distance assures a uniform current which in turn results in uniform case hardening.

The results attained also depend to a large degree on the frequency, power and time the high frequency energy is applied. The five million cycle frequency and the 25 kw. of power output assures that only the "skin" is heated and for such a short period of time that no appreciable conduction of heat is possible to affect the physical properties of the inner layers. The depth of hardening is controlled by the length of time high frequency energy is applied and can be easily adjusted.

This system lends itself readily to mass production. A conveyor or other device may be used to bring the untreated gears to the Megatherm. Each gear is centered in the work coil, heated for its allotted time and then released. Dropping through the quenching medium, the hardened gear falls on another conveyor line carrying it to its next station.

Since the time necessary to harden the surface to a sufficient depth can be reduced to as low as $\frac{1}{8}$ sec., the number of gears that can be case hardened per hour runs into the thousands. The heat treat cost per gear amounts to a fraction of a cent, including amortization of equipment.

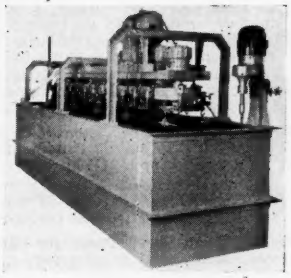
The Megatherm unit has simple push button control and requires no tuning or other technical adjustment. The units are compact requiring 4x4 ft. floor space, and are well adapted to "in the line production."

Mention R971 When Writing or Using Reader Service.

NEW HIGH SPEED PLATER

Lasalco, Inc.,
2818 LaSalle St., St. Louis 10, Mo.

New reciprocating type semi-automatic high speed plating machine with rotating cathode has been put in service within the past few weeks with a leading aircraft plant. This new machine utilizes manhours more efficiently, and promises notable cost reductions because of its ability to maintain the even quality of solution at the cathode, its construction to prevent the corrosion of operating parts, and its adaptability for plating inside surfaces of bearings and other similar parts, large and small.



A single drive maintains both reciprocating action and chain travel, with the chain and mechanism submerged in oil to prevent corrosion. This latter mechanism is almost entirely enclosed. Plating tank can be provided with agitator boot for either a single type of solution agitation, or a combination of several motions. The machine can be furnished in any size to suit specific requirements or conditions.

Mention R972 When Writing or Using Reader Service.

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A.S.M. Review of Current Metal Literature—*Continued*

23. INDUSTRIAL USES *(cont.)*

23-111. **Increased Use of Gray Cast Iron in High Temperature Operations.** C. O. Burgess and T. E. Barlow. *American Foundryman,* v. 7, May '45, pp. 57-65.
Survey of the behavior of cast iron in elevated temperature applications. Detailed information on 233 commercial applications of cast iron at temperatures over 450° F. was obtained from 99 concerns and 108 individuals. Data show that within a temperature range of 450 to 1000° F., cast irons of controlled analysis can be successfully employed in numerous engineering applications. Included in these applications are castings which must resist pressure and be free from small dimensional changes.

23-112. **The Snow Cruiser.** *Modern Metals,* v. 1, May '45, pp. 4-5.
Cab is an all-aluminum structure, and the manufacturers are looking forward to using aluminum in greater quantities after they have an opportunity to redesign the cruiser.

23-113. **Magnesium Air Ducts.** L. T. Holtzman. *Modern Metals,* v. 1, May '45, pp. 6-7
Development for wrought magnesium, which was considered infeasible at the outbreak of war. Aircraft manufacturers anxious and willing to consider many new components in magnesium for future aircraft.

23-114. **Aluminum Life Boats.** *Modern Metals,* v. 1, May '45, pp. 10-11.
Saving in weight, increased capacity, lower maintenance cost and longer life, are some factors which will contribute to large-scale application of aluminum in the boat industry. The rapidly expanding future is readily obvious in this article.

23-115. **Aluminum Windows.** *Modern Metals,* v. 1, May '45, pp. 16-17.
Market for aluminum windows after the war looms up large. New knowledge of forming, improved production methods and lower cost raw material will allow aluminum to compete with other products. New homes and buildings will be the main market, but in addition there is a large replacement potential for steel windows which had to go unpainted during the past four years.

23-116. **Light Alloy Pistons.** C. F. Russell and E. B. Graham. Institution of Automobile Engineers *Journal,* v. 13, April '45, pp. 131-165.
General review of light alloy piston development with particular reference to design, materials, manufacturing technique, and performance.

23-117. **High-Speed Passenger-Car Trucks.** K. F. Nystrom. *Mechanical Engineering,* v. 67, May '45, pp. 313-318.
Studies and developments in design and construction.

23-118. **Physical Properties of Automotive Bolts.** E. O. Mann. *Fasteners,* v. 2, no. 1, pp. 4-6.
The need for properly designed fasteners is critical in many automotive applications. Specifications should adhere to final physical properties rather than to chemical analysis or methods of manufacture.

23-119. **Gray Iron Castings for Power Plant Equipment.** Pat Dwyer. *Foundry,* v. 73, May '45, pp. 108-111, 210, 212, 214.
Description of plant.

23-120. **Producing Hollow-Steel Aircraft Propeller Blades.** *Machinery* (London), v. 66, March 22, '45, pp. 305-310.
Light weight blades with superior resistance against erosion; because of their greater strength they are less easily damaged, not only in combat, but also in take-off and landing. Describes the interesting features of some welding and forming operations.

23-121. **Research Brings Better Railroading.** *Railway Age,* v. 118, May 5, '45, pp. 794-796, 798.
Back of the Norfolk & Western's transportation record are years of steady and progressive development based on laboratory and field studies. Batteries; abrasive testing machine; how to prevent rail shelling; cold rolling; better journal bearings; engine springs.

23-122. **Aluminum for Locomotives.** *Modern Metals,* v. 1, May '45, p. 9.
New York Central's new 6,000 h.p. locomotive, the Niagara, is constructed of over 3 tons of aluminum, reduces dead weight.

24. DESIGN

24-35. **The Measurement of Thread Form for Screws of Moderate Rake.** *Machinery* (London), v. 66, March 29, '45, p. 339.
Diagram represents both axial and normal sections of a thread whose fundamental triangle has a depth d and pitch p.

24-36. **Formed Sheet Metal Parts Classified by Shape, III.** Mark P. Meinel. *Product Engineering,* v. 16, May '45 pp. 334-338.
A classification of formed sheet metal parts, particularly applicable to aluminum alloys, discussed from the standpoint of design of such parts to simplify production. Suitable production methods and machines for each class given.

24-37. **The Use of Dowel-Pins in Precision Tool Design.** E. E. J. *Machinery* (London), v. 66, April 5, '45, pp. 372-373.
Dowel-pins should be employed for locating purposes only and never to replace a screw for fastening purposes. General rules given.

24-38. **Producing Template Negatives on the Draftsman's Table.** *Iron Age,* v. 155, May 10, '45, pp. 84-85.
Photographic device making possible the production of negatives of changes on drawings while on the draftsman's table, eliminating many delays; enables engineers to make small spot reproductions from larger master line drawings.

24-39. **Refining the Design of a Thread Roller.** Richard K. Lotz. *Machine Design,* v. 17, May '45, pp. 99-104.
Employment of cylindrical rotating dies makes available die surfaces of infinite length. This extension of die surface obviates one of the primary drawbacks of flat-die rolling—"rapid penetration."

25. MISCELLANEOUS

25-45. **Chemical Products From Metal Works.** A. G. Arend. *Chemical Age,* v. 52, April 7, '45, pp. 309-312.
Potential post-war developments. Demand for metal salts; lead and tin products.

25-46. **Forecasting Aircraft Propulsion.** Colin Carmichael. *Machine Design,* v. 17, April '45, pp. 103-108.
Recent engineering trends discussed, and the significance of new developments such as the gas turbine, jet propulsion and rocket propulsion, as well as the conventional engine-propeller arrangement, will be evaluated in terms of their suitability in particular fields of application.

25-47. **Tricky Problems in Materials Handling.** Wilbur G. Hudson. *Industry & Power,* v. 48, May '45, pp. 61-63.
Unique, practical information is contained in this experienced engineer's description of how unusual problems in bulk materials handling were solved. Additional problems will be covered in a subsequent installment.

25-48. **Grading of Diamond Powder Approved Commercial Standard CS123-45.** *Wire & Wire Products,* v. 20, May '45, pp. 346-347, 350.
Purpose; scope; definitions; general requirements; detail requirements; methods of sampling and inspection; guarantee.

25-49. **Robot "Assemblers."** G. W. Birdsall. *Steel,* v. 116, May 14, '45, pp. 102-105, 136, 138.
Machine automatically positions nut on under side of assembly, feeds screw down through assembly, threads it into nut, tightens screw to any predetermined tension desired; drives any type head, all types of machine, sheet metal and self-tapping screws. Typical setup drives six screws in single assembly in 8 seconds, including time to unload and reload fixtures. Tensions up to 70 ft.-lb. are available for driving hardened cap screws.

25-50. **Fabrication and Treatment.** *Metals & Alloys,* v. 21, April '45, pp. 1080, 1082, 1084, 1086, 1088, 1090, 1092, 1094, 1096, 1098, 1100, 1102, 1104, 1106, 1108, 1110.
Machining, forging, forming, heat treating and heating, welding and joining, cleaning and finishing of solid materials. Methods, equipment, auxiliaries and control instruments for processing metals and nonmetals and for product fabrication.

25-51. **Centralized vs. Decentralized Aircraft Research Organizations, V.** K. R. Jackman. *Aviation,* v. 44, May '45, pp. 145-149, 250, 252.
Advantages and disadvantages encountered when research activities are organized in the "concentrated" form and the "separate-function" type of setup. Considers the work of specific governmental and industrial research organizations, citing the values afforded through cooperation of these agencies. 7 ref.

25-52. **Critical Points.** *Metal Progress,* v. 47, May '45, pp. 916-920.
Stainless steel sheet for easy welding. Crackless plasticity. Wanted: Tough steels, tough even when cold. Metallurgical versatility. Is there a ceiling? Bayer process for refining aluminum ore. Lime-sinter adjunct. Alumina from clay. Systematic studies of high temperature alloys. Speed the testing. Estimates of grain-boundary areas. Magical strain gages. Design 100% and work to very limits. Three locomotives every day. High speed—really *high* speed.

26. STATISTICS

26-83. **Swedish Iron Production After the First World** War and Now. *Teknisk Tidskrift,* v. 75, Jan. 13, '45, pp. 39-40. Iron and Steel Institute *Bulletin,* no. 111, March '45, p. 121-A.
The commercial aspects of the Swedish iron and steel industry in the 1920 and 1930 decades are compared and the problems with which it is likely to be faced at the end of the present war are discussed.

26-84. **Lead and Zinc Production in the Pacific Northwest.** N. H. Engle. *Western Metals,* v. 3, April '45, pp. 28, 31.
Statistics.

26-85. **Change in Tariff Would Injure Competitive Position of Domestic Producers of Copper.** Louis S. Cates. *Metals,* v. 15, April '45, pp. 6-7, 16.
Would result in extensive unemployment in mining areas; stockpiling will prevent mine shutdowns at end of war.

26-86. **Tin Stocks Low.** Fred W. Willard. *Metals,* v. 15, April '45, pp. 8, 14.
Detinning facilities available; problem of getting adequate scrap supply unsolved.

26-87. **Further Reductions in Import Duties Would Prove Harmful to Tri-State Zinc District.** F. F. Netzeband. *Metals,* v. 15, April '45, pp. 13-14.
Concessions granted to one country under reciprocal trade agreement become available to practically all others.

26-88. **Lord Geddes Defends Copper Cartel as Aid to Industry as Well as Market Stability.** L. H. Tarring. *Metals,* v. 15, April '45, pp. 15-16.
Says competition would have destroyed Rhodesian producers; favors giving government full information at all times.

26-89. **Approaching V-E Day Makes Metal Consumers Inventory Conscious; Purchases Restricted.** *Metals,* v. 15, April '45, pp. 17-21.
Copper and zinc deliveries to consumers in March set new high records; forward requirements anticipated.

26-90. **The Future of Our Mineral Production.** Carl H. Wilken. *Mines Magazine,* v. 35, March '45, pp. 119-122.
National income determined by raw material income; formula; raw material income affects national economy; effect of importation of raw materials; effect of sub-parity prices on national income; value of foreign trade; sound economy for United States; stabilized price level.

26-91. **Raw Materials and Foreign Policies of Nations.** Meherwan Cavasji Irani. *Mines Magazine,* v. 35, March '45, pp. 123-126, 136, 139.
International control of tin.

26-92. **Battle-Tested Aluminum.** David P. Reynolds. *Industrial Marketing,* v. 30, May '45, pp. 49-50, 58, 62.
What of the future?; knowledge of uses increasing; mines to be important users; transportation equipment profits from aluminum; marine equipment of aluminum; outstanding as packaging material; other uses.

27. NEW BOOKS

27-70. **The Arc Spectrum of Iron (Fe 1).** 207 pp., illus., paper, Transactions of the American Philosophical Society, New Series, v. 34, pt. 2. $2.25.

27-71. **Metallography of Magnesium and Its Alloys.** Walter Bulian and Eberhard Fahrenhorst. Translated from the German. 117 pp., illus., F. A. Hughes & Co., Ltd., Abbey House, N.W.1, London, England.
Polishing and etching technique; crystal habbit. Pure magnesium, the binary magnesium-manganese alloy, special alloys, corrosion, alloys of magnesium with aluminum and zinc (die cast billets, extruded material, sheets, forgings, sand castings, pressure die castings). Macro-etching and fracture forms; literature references.

27-72. **The Chemistry of Acetylene.** Julius A. Nieuwland and Richard R. Vogt. Reinhold Publishing Co., 330 West 42nd St., New York. $4.00.
Preparation, properties and reactions of acetylene. Manufacture of calcium carbide and the uses of acetylene as a raw material for industrial syntheses. Extensive bibliography of the literature through 1938.

27-73. **The Chemical Process Industries.** R. Norris Shreve. 957 pp., illus. McGraw-Hill Book Co., 330 West 42nd St., New York. $7.50.
Industrial chemistry from viewpoint of chemical engineers. Fuels, power, and air conditioning; fuel gases; ceramic industries; salt and sodium compounds; fermentation industries. Over 100 flow sheets.

27-74. **Introduction to Practical Radio.** Durward J. Tucker. 338 pp., illus., diagrs. Macmillan Publishing Co., New York. $3.00.
A basic text of the fundamental principles of radio, giving specific examples of practical applications, and the necessary mathematical tools.

27-75. **Steel Plant Refractories: Testing, Research and Development.** J. H. Chesters. 509 pp., United Steel Companies, Ltd., Sheffield, England.
A compilation of author's results of ten years' work in the refractories section of the Central Research Department of the United Steel Companies, Ltd., and of practical experience of other workers in this field. Methods of testing; silica and semi-silica; magnesite; dolomite; chrome and chrome-magnesite; aluminosilicates; insulation; basic open-hearth furnace above and below the sill-plate level; acid open-hearth furnace; acid and basic bessemer converters; electric steel plant; soaking pits and reheating furnaces; the casting pit. Appendices (46 pp.) give glossary of terms, properties of bricks, conversion tables and other useful data.

27-76. **Reports on the Measurement of Surface Finish by Stylus Methods.** R. E. Reason and R. I. Garrod. Taylor, Taylor and Hobson, Ltd., 30s.

27-77. **Praktische Physik; 17th ed.** Friedrich Kohlrausch. 958 pp., diagrs., Mary S. Rosenberg, 235 W. 108th St., New York 25, N. Y. $8.75.

27-78. **Einführung in die Elektronik.** Otto Klemperer. 303 pp., diagrs. Mary S. Rosenberg, 235 W. 108th St., New York 25, N. Y. $6.50.

Strain Gage, Stresscoat, Fatigue Machine Described as New Engineering Tools

Reported by Ralph W. Stahl
Lindberg Engineering Co.

Francis G. Tatnall, manager of the Testing Equipment Department of the Baldwin Locomotive Works, provided the Indianapolis Chapter with one of the most fascinating meetings in years. Speaking rapidly and with great enthusiasm, Mr. Tatnall called his subject, "The Engineering Revolution."

He described three recently developed and vitally important engineering tools—namely, the SR-4 strain gage, "Stresscoat" brittle lacquer for stress analysis, and a structural fatigue machine used to test the design, workmanship and material in finished assemblies. Mr. Tatnall's talk has been reported in previous issues of THE METALS REVIEW.

Shepherd Discusses Martempering

Reported by F. P. Kristufek
U. S. Steel Corp., Research Laboratory

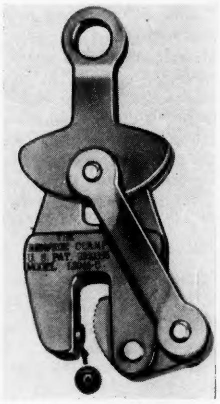
"Martempering and Related Processes" was the subject of a talk by B. F. Shepherd, chief metallurgist, Ingersoll-Rand Co., at the March 19th meeting of the New Jersey Chapter, A.S.M. Technical Chairman Janet Briggs led an active discussion which followed Mr. Shepherd's highly practical talk.

NEW PRODUCTS IN REVIEW

CLAMP FOR LIFTING STEEL

Paul Henry Co.,
2037 South La Cienega Blvd., Los Angeles, Calif.

An entirely new type of clamp for lifting steel plate is now marketed under the name of Renfroe.



A number of features distinguished this clamp. The use of cable sliding through rings or guides to actuate the gripping cam is eliminated, which in turn saves the time usually required for inspection of cable. Through the action of the gripping cam shackle, the work is gripped instantly and firmly the moment tension is applied to the lift by the crane even though the body of the clamp is in a horizontal position. The operator, therefore, does not have to hold tension by means of a cable, and stand in a dangerous position until the clamp starts to operate.

Attention is also called to the inserted swivel jaw opposite the gripping cam of the Renfroe clamp. In conjunction with the gripping cam, the swivel jaw is said to provide a deeper and more secure bite on the plate. Swivel jaws and gripping cam, and all other working or stationary parts of the Renfroe clamp, are readily replaced.

All parts of the Renfroe clamp are made of steel specially selected according to the particular function of each part. The clamps are available in 1, 1½, 3, 5, 10 and 20-ton capacities.

Mention R973 When Writing or Using Reader Service.

NEW MANUFACTURER OF PROTECTIVE COATING MATERIAL

Peninsular Chemical Products Co.,
6795 E. Nine Mile Rd., Van Dyke, Mich.

Announcement has been made of the organization of this company to maufacture complete lines of protective coating materials for the plating industry and for other industrial uses.

Production has been started on rack coating lacquers, masking lacquers and tape, stop-off wax, and specialized protective coatings for industrial purposes. A layout dye, used as a background for preparing scribed layouts on metal, will also be manufactured.

Mention R974 When Writing or Using Reader Service.

MULTI-PURPOSE WELDING POSITIONER

Standard Machinery Co., Providence 7, R. I.

The latest design in powered welding positioners is introduced by this company for rotating work up to 700 lb. at speeds from 0 to 2.4 r.p.m. in either direction by easy hand wheel control. The unit will accommodate table speeds up to 180 in. per min. with a work radius of 1 ft. Linear speeds at all radii are easily set and indicated on scale located on side of frame.

To obtain a desired welding speed it is only necessary for the operator to note the approximate radius at which the welding is to be done and to move the control wheel until the indicator is opposite the desired welding speed in the scale column for that radius. For sequence or step welding the table may be positively started, stopped or reversed.

The machine has proven adaptable for moving work past the torch and quench in flame hardening operations. The table can be removed easily and various jigs attached directly to the spindle. Also the work mounted on the positioner table may be tilted to any angle, permitting the worker to operate at one position and so facilitate the inspection of parts or assembly operations.

While the table was originally designed for use as a support for parts to be welded and is only 28 in. in diameter, it may be utilized also as a basis of power in moving fixtures and work across machine tool tables.

Height of the table is adjusted between 30 and 36 in. from the floor by means of its elevating screw. Hand operation of a latch permits rotation of the screw with respect to its supporting sleeve.

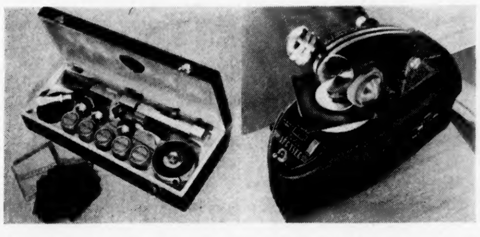
Mention R975 When Writing or Using Reader Service.

IMPROVED ABRASER

Taber Instrument Corp., North Tonawanda, N. Y.

This improved Taber Abraser is now available in a complete testing set which includes the abraser, with all accessories, together with a specimen table for running tests under wet or moist conditions. An illuminated magnifier for the inspection and examination of specimens is part of the set.

The abraser is used to determine the wear or abrasion resistance of practically every material subject to surface abrasion.



The wearing action of the abraser is performed by dual calibrase wheels bearing against the specimen under constant pressure, revolving in opposite directions, one sliding radially toward the outside and the other sliding toward the inside of the wear path. Each wheel revolving at a steady constant speed through contact with the specimen exerts a combined abrasive, compressive and twisting action twice in each revolution of the specimen holder. Because the specimen holder travels a complete circle, the wear due to the difference of grain or weave is fully revealed. A standardized load adjustment is provided for varying the pressure of the calibrase wheels against the specimen so the abraser will test both delicate and tough materials with equal precision.

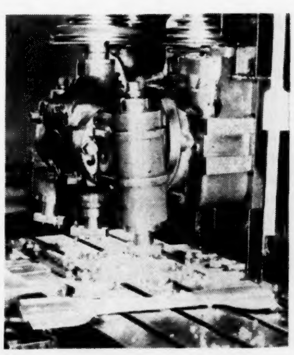
The abraser is self-contained and ready to operate by simply plugging into an electric line. The results of tests are reported either as the number of "wear cycles" or as "loss in weight" when weighed on a precision laboratory balance. An attractive bulletin shows the design and application of the abraser.

Mention R976 When Writing or Using Reader Service.

NEW PRODUCTION TECHNIQUE FOR ALUMINUM AND MAGNESIUM

Aircraft Products Mfg. Corp.,
Des Plaines, Ill.

A new and unique production service technique has been developed by this company for the rapid and accurate machining of aluminum and magnesium. On the aluminum casting illustrated the elimination of two setups, two milling fixtures, and two handlings, with a 12-in. reduction in table travel distance, made a substantial reduction in costs. Part runs from 100 to 10,000 pieces or more, both simple and intricate, can be processed as readily.



The Hack Machine Co. has developed a battery of special machines with versatile and specialized interchangeable attachments which eliminate many of the tools and fixtures used in the usual machining processes, saving up to 50% or more of tool and fixture cost. On aluminum and magnesium parts, a sequence of operations such as surfacing, boring, milling and drilling can be carried out at one setting without disturbing the piece or holding fixture.

Special machines permit the mounting of four heads on the master head at the same time. This makes possible the multiple production of up to four pieces simultaneously. By setting up the machine instead of the job (and by means of coordinating special combinations of heads with vernier scales built into the machines) precise position of the part in relation to cutting tools is possible in all directions. This method provides jib bore precision between related surfaces whether drilled, slotted or milled. Inaccuracies resulting from transfer of parts from jig to jig are eliminated. Complete details of this service are available.

Mention R977 When Writing or Using Reader Service.

OPTICAL CENTER-LOCATOR

Master Specialty Co.,
5700 Cedar Ave., Minneapolis 7, Minn.

This optical center-locator set is an aid to the construction of tools, dies, molds and patterns and at the same time provides an extremely fine degree of accuracy.

After the work has been carefully laid out by means of a vernier height gage and a surface plate, the compound magnifier is clamped into the holding fixture and it is then slowly moved over the intersecting layout lines. Once the reference circle, which is etched on the sight glass, is exactly centered over the layout lines the holding fixture is clamped to the work. The magnifier is then removed from the holding fixture and the correct size drill bushing is substituted.

All drill bushings are hardened, then precision ground to be concentric. The outside diameter of each drill bushing is exactly the same as the diameter of the lower magnifier ring which contains the sight glass on which the reference circle is etched. When a drill bushing is substituted for the magnifier in the holding fixture the center of the bushing is very precisely located over the intersecting layout lines. Holes can easily be located and drilled within an accuracy of 0.001 in.

Time may be saved with the optical center-locator when it is applied to jobs where tool makers' buttons would ordinarily be used. It provides an accurate means of center punching. It makes possible the drilling of true round holes in thin metal or bakelite. In addition to assisting in these and other drilling procedures, the optical center-locator can be used to facilitate alignment of work when a scribed line must be parallel to the stroke of a shaper.

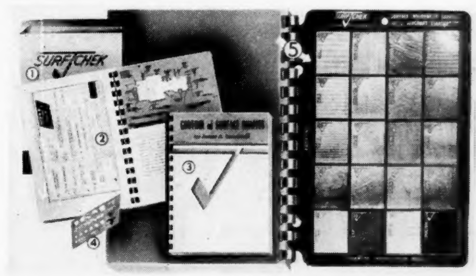
Mention R978 When Writing or Using Reader Service.

SURFACE CONTROL

Surface Checking Gage Co.,
Hollywood 28, Calif.

To meet the trend toward ever-increasing uniformity in surface control, this company has produced the Surf-Chek Roughness Standards, a development of J. A. Broadston at North American Aviation, Inc.

Produced at low cost, the kit contains a 65-page educational text bound to a gage consisting of 20 replicas of



machined surfaces, prepared by turning, grinding, milling, honing, lapping and polishing, which vary in roughness from 500 to 5 micro-inches. The replicas are molded into a 5x7-in. plastic plate through the use of precise die inserts.

In the past, finish designations expressed only individual opinions. This method of designation eliminates guess interpretation, conveys the engineer's specific instructions to the machinist, and enables anyone to make rapid and efficient roughness comparisons, without the need of any other special instruments.

Mention R979 When Writing or Using Rerder Service.

INDUCTION HEATING WORK TABLE

Induction Heating Corp.,
389 Lafayette St., New York 3, N. Y.

A new single-position, general-purpose work table offering flexibility in range of applications when used with standard Thermonic induction generators is announced by this company.

Equipped with a standard Thermonic output transformer, so mounted as to effect interchangeability from one type transformer to another, this table can be used for any application of induction heating. The table bench includes a sink for use in spray quenching operations. This sink is provided with a removable transite cover which can be used when a flat working surface is desired. The illustration shows the table with the sink open (cover removed).

Water piping provisions for spray quenching are incorporated in the table, together with a solenoid-operated valve and a quench flow regulator for controlling the timing and volume of the quench. The control circuit contains two timers—one for controlling the quenching period and the other for controlling the delay period from the end of the heating cycle to the start of the quench cycle. (The heating-cycle timer itself is located directly in the Thermonic induction generator). Start and stop control buttons to energize the Thermonic generator are mounted on the front of the table, together with pilot light indicators.

The flexibility provided by this table has proven invaluable in miscellaneous heat treating and brazing applications where short runs are predominant and where numerous changes from one type of coil to another must be made.

Mention R980 When Writing or Using Reader Service.

MANUFACTURERS' CATALOGS IN REVIEW

Tool Bit Selection

Carpenter Steel Co., Reading, Pa.

This new folder contains useful information on tool bit selection, showing the type of bit to use for various types of work such as intermittent cutting; fast, continuous cutting, fine finishing, and hogging or rough turning operations. This folder is an aid in lengthening tool life and stepping up output per grind.

Mention R981 When Writing or Using Reader Service.

Abraser Testing Handbook

Taber Instrument Corp., North Tonawanda, N. Y.

This 16-page, attractive booklet describes the Taber Abraser test as revealing exactly what you want to know about surface wear due to rubbing abrasion. The Taber wear rating provides a standard value for the wearability of materials and surfaces. This booklet explains the range of applications for this equipment and the resulting benefit. The book is well illustrated with pictures of the equipment and accessories. A list of users is presented.

Mention R982 When Writing or Using Reader Service.

Metal Cleaners

Klem Chemical Works,
1500 E. Woodbridge Ave., Detroit 7, Mich.

This eight-page leaflet describes cleaning, derusting, phosphatizing, soldering and maintenance process in relation to Klem Kleaners and Klem products. A step-by-step procedure is outlined to show the diversified uses of these products. Fully described processes explain the use of phosphoric acid cleaners, alkali power wash and still tank cleaners, soldering fluxes, spray booth compounds and enamel or paint removers. Included is a layout chart of the concentrations of the cleaners used for respective work, and under specific conditions.

Mention R983 When Writing or Using Reader Service.

Bearing Bronze

Bearium Metals Corp., 258 State St., Rochester, N. Y.

This three-color, six-page folder describes the frictional properties of Bearium Metals and illustrates typical bar stock sizes and individual castings. Photomicrographs show structure and lead distribution achieved in production of this metal, which account for its advantages for bearings, bushings, thrust washers and other requirements involving rubbing friction. While the metal contains finely dispersed particles of lead in microscopic, globular form, no oxides, fluxes or agents are used to accomplish this purpose and only virgin metals enter into its composition.

Mention R984 When Writing or Using Reader Service.

Ampcoloy Bronzes

Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis.

Bulletin 59 is a 12-page leaflet describing Ampcoloy alloys, a series of bronzes of controlled analysis. The bulletin presents photomicrographs, physical properties and chemical compositions of this series. Among the Ampcoloy alloys are aluminum bronze, high lead bronze, tin bronze, manganese bronze, beryllium copper and high conductivity alloys.

Ampcoloy bronzes are made in the same plant and under the same conditions as Ampco Metal. They are produced to quality standards and many of them meet government specifications.

Mention R985 When Writing or Using Reader Service.

Mercury Arc Converters

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Detailed information on the first standard mercury arc converters designed for induction heating operations in the 500 to 2000 cycle frequency range is presented in this well-illustrated eight-page bulletin known as B6373. How this company supplies all essential apparatus for complete induction heating installations, including coils, furnaces, and cubicles is explained by a drawing and wiring diagram of a typical mercury arc converter installation. As frequency changer equipment, the Excitron mercury arc converters have a conversion efficiency of 90% or better. Units are built to supply power for induction heating in blocks of 250, 500, and 1000 kw. and higher.

Graphs and "exploded" views of the Excitron converter compare it favorably to other types of equipment used for induction heating. Differences in methods of heating and melting metals are summarized in quick-reading, illustrated form.

Mention R986 When Writing or Using Reader Service.

How Carborundum Serves Industry

The Carborundum Co., Niagara Falls, N. Y.

This attractive 24-page booklet tells a story in words and pictures of the history and the development of this company. The booklet describes the company's development of abrasives, refractories and globar electric furnace heating elements. Many photographs are used to make this a very interesting presentation of this company's scope and facilities.

Mention R987 When Writing or Using Reader Service.

Powder Metal Catalog

Chrysler Corp., Amplex Division,
6501 Harper Ave., Detroit 31, Mich.

This 168-page Oilite Catalog of powder metal bearing parts points out that, in addition to the well-known feature of self-lubrication inherent in powder metal bearings and parts, Oilite products provide such additional advantages as quick tool-up and delivery, new alloys, economies, elimination of most machining, and characteristics unobtainable from standard manufacturing methods.

During the past few years the number of available die sizes for the making of Oilite bearings has been doubled. The range of more than 13,000 sizes listed in the new catalog offers the manufacturer a wider selection for his war production activities. In addition to the listing of new die sizes, this catalog contains a section on cored and bar stock. This has proved a great asset to war production by making Oilite quickly available, ready for machining to correct size.

In a handsome format the new book is complete with load-charts, mechanical drawings, pertinent engineering data and a section devoted to photographs and descriptive material.

Mention R988 When Writing or Using Reader Service.

Electronic Controls

Wheelco Instruments Co.,
Harrison & Peoria Sts., Chicago, Ill.

Known as Z-6300, this 12-page catalog is designed to supply a convenient, condensed listing of principal items of equipment supplied by this company. The bulletin describes the company's electronic principle by which control is effected without contact between measuring and control units of an instrument, and gives brief descriptions and prices of indicating pyrometers and pyrometer controllers, indicating resistance thermometers and resistance thermometer controllers, input controllers, program controllers, portable potentiometers, combustion safeguards, and thermocouples.

Mention R989 When Writing or Using Reader Service.

Aluminum Degassing

Foundry Service, Inc.,
280 Madison Ave., New York 16, N. Y.

This company has issued a bulletin on its aluminum degassers showing methods of degassing, grain refining and improving aluminum and aluminum alloys. Various advantages of this company's degassers are listed along with the principle of degassing.

Mention R990 When Writing or Using Reader Service.

All-Purpose Sander

Exactone Tool & Die Co.,
4373 Melrose Ave., Hollywood 27, Calif.

Introducing the new Sand-O-Flex all-purpose sander, this four-page folder explains how this new device sands, deburrs, finishes and polishes small metal parts quickly and effortlessly. This is a brush-backed sanding wheel that is particularly effective on irregular surfaces and on jobs that were formerly done only by hand. It can be used on stationary and flexible shafts, or on portable electric tools.

Mention R991 When Writing or Using Reader Service.

Welders' Charts

American Optical Co., Southbridge, Mass.

This new reference chart for welders points out the proper shades of filter lenses to wear for different types of welding operations. It helps to simplify and speed the welder's work in addition to guarding his eye-sight. For example, in oxy-acetylene torch cutting and welding the shades of filter lenses are classified according to whether the cutting or welding is light, medium or heavy. Of great importance to the welder, the shades for electric welding are classified according to the different diameters of the welding rods; consideration has also been given to the use of carbon, helium and atomic hydrogen arcs. The chart is printed on substantial light weight cardboard.

Mention R992 When Writing or Using Reader Service.

Low Temperature Welding

Eutectic Welding Alloys Co.,
40 Worth St., New York 13, N. Y.

A new and attractive four-page folder provides a complete answer to the question "What are Eutectic low temperature welding alloys?" Among the outstanding features claimed for the rods are unusually low bonding temperatures that prevent distortion, less preheating of parent metal required, less after machining and cleaning. Eutectic welding establishes a greater strength than brazing, with less rejects, and insures a greater all-around economy during use.

Specific applications, uses, and specifications on design and procedure of the various rods are also featured. A full-page assortment chart designed to aid engineers, technicians and welders in selecting the proper rod for their particular job is included.

Mention R993 When Writing or Using Reader Service.

Bright Nickel Plating

The Udylite Corp., Detroit 11, Mich.

Bright nickel has gained favor as a protective and ornamental coating on many articles in widely diversified fields because of several unusual advantages, according to this eight-page leaflet. Because the nickel is plated bright, buffing costs are greatly reduced or completely eliminated. Also cut-throughs and other buffing rejects are eliminated. It makes bright finish possible on objects which cannot be buffed economically. Nickel can be plated bright on complex shapes extremely difficult to buff. Moreover fast plating steps up production and reduces man-hour costs. The leaflet lists some of the products on which bright nickel has been used and describes the process as presented by Udylite in some detail.

Mention R994 When Writing or Using Reader Service.

Fabrication by Welding

Metal and Thermit Corp., 120 Broadway, New York, N. Y.

This 32-page illustrated booklet describes fabrication and repair by Thermit welding. The process is explained in detail and there is a series of four-color charts which illustrate in cross-section the forming of a Thermit weld.

The booklet contains a fund of information relating to general fabrication, repairs to heavy equipment, such as crankshafts, axles, cylinders and housings; rail welding for steam and street railways, coal mine track, and crane railways. Thermit welding in marine work is described, including the fabrication of stern frames, and the repair of heavy parts.

Mention R995 When Writing or Using Reader Service.

Steel Forgings

National Forge & Ordnance Co.,
Irvine, Warren County, Pa.

"How long is it since you visited a modern forge plant?" This is the challenging thought expressed at the start of this new booklet being presented to the users of heavy duty steel forgings. This thought of going through a forging plant keynotes the entire contents of the book, which is planned to bring the high points of such a trip to the reader who does not have the time or opportunity to visit the plant in person.

The basic operations of making a finished steel forging, as carried on at this company, are covered with a great deal of pictorial emphasis. The many on-the-spot photographs which illustrate the entire book give one the feeling of being within the large National Forge plant, for they parallel the progress of a forging from the making of the electric steel through the forge-smithing and heat treating to the finish machining.

The facts that naturally go with such pictures are presented in a forthright, unadorned manner which makes the book all the more helpful.

Mention R996 When Writing or Using Reader Service.

Electrode Comparison Chart

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

A comparison chart of welding electrodes comparing equipment from 22 electrode manufacturers takes the form of an eight-page bulletin containing information on stainless steel and hard surfacing electrodes, as well as the mild steel type. A section is devoted to a typical weld deposit analysis of stainless steel electrodes, showing the percentages of chromium, nickel, carbon, columbium, and molybdenum.

Mention R997 When Writing or Using Reader Service.

The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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